A COMPARATIVE STUDY OF LAPAROSCOPIC MESH REPAIR VERSUS OPEN MESH REPAIR FOR INCISIONAL HERNIA

Dissertation submitted in partial fulfillment of regulation for the award of M.S. Degree in General Surgery (Branch I)

THE TAMILNADU DR. M.G.R. MEDICAL UNIVERSITY

CHENNAI

APRIL, 2013.

CERTIFICATE

This is to certify that this dissertation titled ***"A COMPARITIVE STUDY OF LAPARASCOPIC MESH REPAIR VERSUS OPEN MESH REPAIR FOR INCISIONAL HERNIA "*** submitted to the Tamil Nadu Dr. M.G.R. Medical University, Chennai in partial fulfilment of the requirement for the award of M.S Degree Branch - I (General Surgery) is a bonafide work done by **Dr. SILAMBARASAN.P** , post graduate student in General Surgery under my direct supervision and guidance during the period of August 2011 to August 2012.

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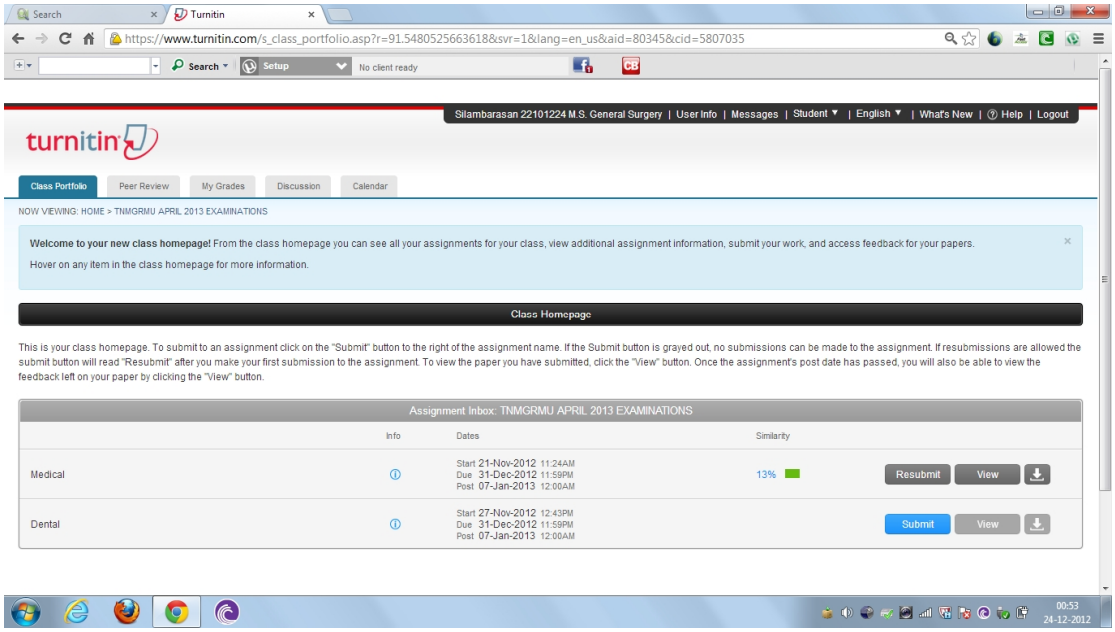
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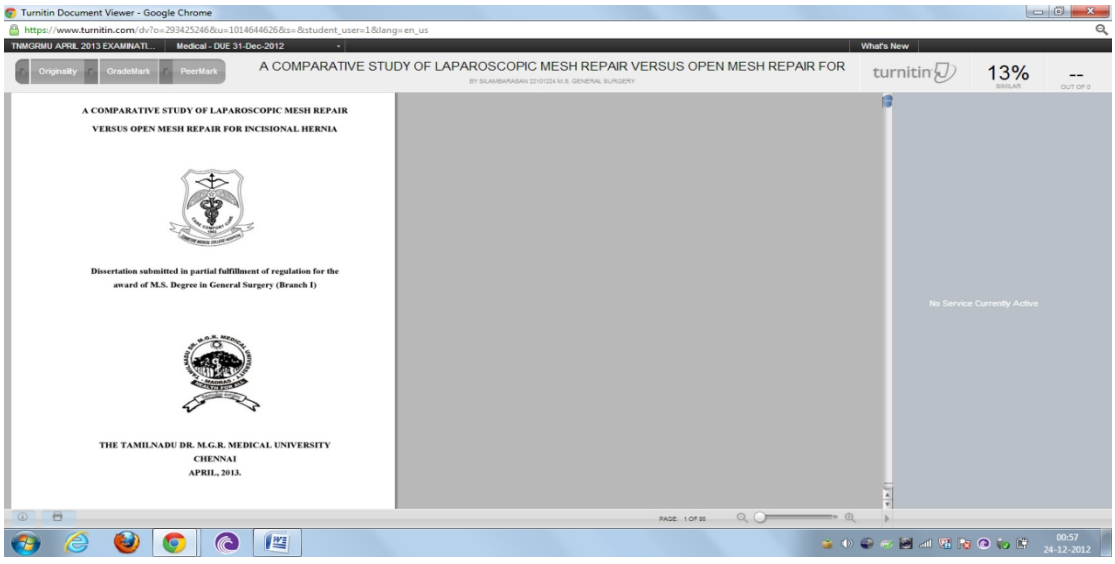
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DECLARATION

I solemnly declare that the dissertation titled **"A Comparative Study of laparoscopic mesh repair versus open mesh repair for Incisional hernia"** at **Coimbatore Medical College Hospital** was done by me from August 2011 to August 2012 under the guidance and supervision of Professor **DR.D.N.RENGANATHAN, M.S.** This dissertation is submitted to the **Tamilnadu Dr. M.G.R. Medical University** towards the partial fulfillment of the requirement for the award of M.S Degree in General Surgery (Branch I).

Place: Coimbatore

Date: **DR. P.SILAMBARASAN**

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LIST OF ABBREVIATIONS

ePTFE - expanded polytetra fluoroethylene

NPO - Nil per oral

CT - Computed tomography

MRI - Magnetic resonance imaging

DVT - Deep vein thrombosis

LAP - Laparoscopic

A COMPARATIVE STUDY OF LAPAROSCOPIC MESH REPAIR VERSUS OPEN MESH REPAIR FOR INCISIONAL HERNIA

ABSTRACT:

Background: Open Incisional hernia repair is associated with significant morbidity. Now a day's laparoscopic Incisional hernia repair has evolved as an attractive alternative.

Aim and objectives: To compare the outcome of Laparoscopic Incisional hernioplasty and Open hernioplasty in terms of Safety and effectiveness, Duration of nil per oral status after surgery, Post operative pain, Post operative wound complications, Duration of hospital stay, Time required to resume regular activities and Cost effectiveness.

Methods: Fifty patients with Incisional hernia were included in this study. Twenty five patients were underwent laparoscopic mesh repair and twenty five patients were under went open mesh repair. No significant difference between the 2 groups was noted regarding patient demographics.

Results: Our study consisted of 50 patients with Incisional hernia 7 of them were males and rest of them were females. Incidence of Incisional hernia is more common in the age group between 41 – 50 years,There is no significant difference between two groups regarding nil per oral status after surgery. Post operative pain, post operative wound complications and duration of hospital stay were less in laparoscopic group than the open group. Patients underwent laparoscopic repair return to their regular activities earlier than open Incisional hernioplasty. Cost of laparoscopic surgery was higher than the open surgery.

Conclusion: Apart from cost effectiveness Laparoscopic Incisional hernioplasty seems to be superior, more advantageous and a better alternative for open hernioplasty.

Keywords: Incisional hernia, Hernioplasty, Laparoscopic , Prosthetic mesh, Post operative.

Introduction

INTRODUCTION

Incisional hernia, otherwise called as postoperative hernia or chronic abdominal dehiscence is result of failure or loss of continuity of fascial closure which is usually covered from inside outwards by peritoneum, scar tissue and skin.

Incisional hernia is a frequent complication of abdominal surgery. The incidence is about 3 to 11 % after laparotomy. There are number of predisposing factors that are responsible for Incisional hernia may be related to

a) Specific patient characteristics,

b) Under lying pathological process for which laparotomy was done,

c) Iatrogenic factors like technique of wound closure & use of suture material.

Incisional hernia most often presents as asymptomatic bulge or swelling but can cause serious morbidity such as incarceration in about 6 to 15% of the patients and strangulation 2% patients. Because of these complications Incisional hernia should be operated as soon as they are diagnosed.

More than hundred years attempts have been made to develop successful method of repairing Incisional hernia but most attempts were

followed by high incidence of recurrence that is after primary repair of Incisional hernia with suture material alone it is 24 to 50%.

The use of biomaterial for Incisional hernia repair markedly reduces the recurrence rates. The prosthesis are mainly placed as inlay or onlay position, ePTFE, polyester, polypropylene are preferred. In any of the method the mesh has to overlap the defect sufficiently because of wound contracture. Disadvantages are high rate of wound complication.

Aim & Objective Of the Study

AIM & OBJECTIVE OF THE STUDY

To compare the outcome of **Laparoscopic Incisional hernioplasty and Open hernioplasty** in terms of

- Safety and effectiveness
- Duration of NPO status after surgery
- Post operative pain
- Post operative wound complications
- Duration of hospital stay
- Time required to resume regular activities
- Cost effectiveness.

Review of Literature

HISTORICAL ASPECT

Major abdominal surgeries developed rapidly during the last century along with it brought the increased incidence of Incisional hernias. Various methods have been attempted for repairing them since then.

In 1836 Gerdy successfully repaired the Incisional hernia. In 1880 Maydil repaired the Incisional hernia in layers. In 1889 Mayos described the horizontal overlapping technique for repair of umbilical hernia. This same method was successfully adopted for Incisional hernia repair.

Repair of this hernia is one of the few instances in surgery in which implants of foreign material where used before the use of natural tissue. Witzel (1900), Bartlet (1903) & Mcgavin (1909) advocated the use of silver wire filigre. Koontz (1940) & Throok mortan (1948) used Tantalon gauze.

These metals fragmented within a short time and recurrence occurred. The fragment of the metal caused skin sinuses and even perforation of the bowel also. In 1920 Gibson described the use of relaxing incisions made vertically in the anterior rectus sheath for the repair of midline Incisional hernia.

Fascia lata graft, used in the form of strips or sheets where reported by Mcarthur (1901), Kirschner (1910) and Gallic mair in 1945

used sheets or strips of skin for repair of Incisional hernia. These tissues tended to be absorbed and had the disadvantages of recurrence, sinus formation and dermoid cyst formation.

Darn technique for repair of Incisional hernia was introduced early in the century; strips of fascia lata, skin and animal tendon were used. Biological threads of silk, cotton and linen were tried. Gosset in 1949 used strips of full thickness autograft skin in darn repair and Abel (1948) used stainless steel for the lattice work. Hunter in 1971 developed the nylon darn technique using monofilament nylon. Abrahanson later described his shoelace darn technique.

After the advent of synthetic plastic materials, plastic sheets by Thomson (1946) and polyoing sponge by shoefiel (1955) were used. The modern era of prosthetic hernia repair had begun in 1958 when Usher reported with polyamide mesh. Use of Marlex mesh in the repair of Incisional hernia was first reported by Usher (1959). Cerise used Mersiline mesh. Recently use of expanded Polytetrafluroethylene mesh (ePTFE) and Goretex patch has been reported by Shar (1980), Jenkin (1983) and Bauer (1987). Leblank ka in 1993 described the laparoscopic repair of Incisional hernias using ePTFE.

SURGICAL ANATOMY OF ANTERIOR ABDOMINAL WALL[2,4,5,6,7,10]

Flat muscles of abdomen & recti are arranged to form an elastic contractile layer around the abdominal cavity protecting its contents. The broad muscles cross each other by an arrangement designed to strength the abdominal wall and diminish the risk of ventral hernias between separated muscle bundles.

The normal musculo - facial layers of abdominal wall serves well in keeping its contents. All the viscera are maintained in position by the tone of muscle, protecting the viscera from external injuries. Increased abdominal pressure helps in micturation, defecation & vomiting.

Anterior abdominal wall from outside to inside consists of eight layers

1) Skin
2) Superficial fascia
3) External oblique muscle & aponeurosis
4) Internal oblique muscle & aponeurosis
5) Transverse abdominis muscle & aponeurosis
6) Fascia transversalis
7) Extra peritoneal fatty layer
8) Parietal peritoneum

SURGICAL ANATOMY OF ANTERIOR ABDOMINAL WALL

FIGURE 1: MUSCLES OF ANTERIOR ABDOMINAL WALL

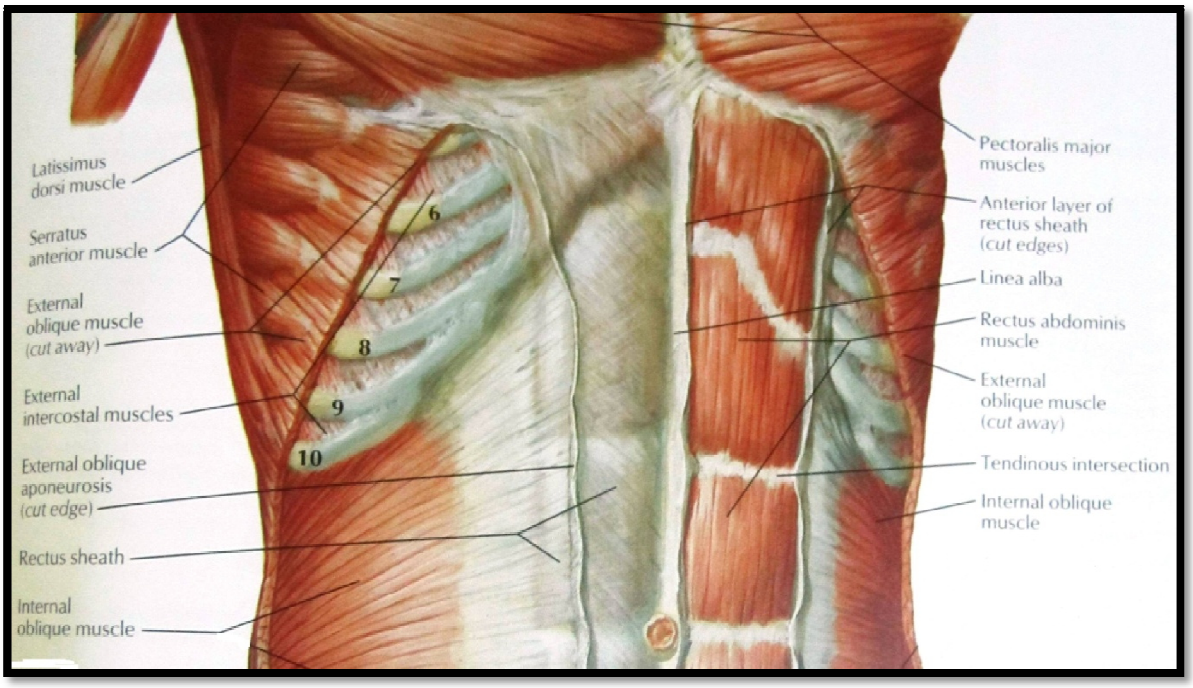
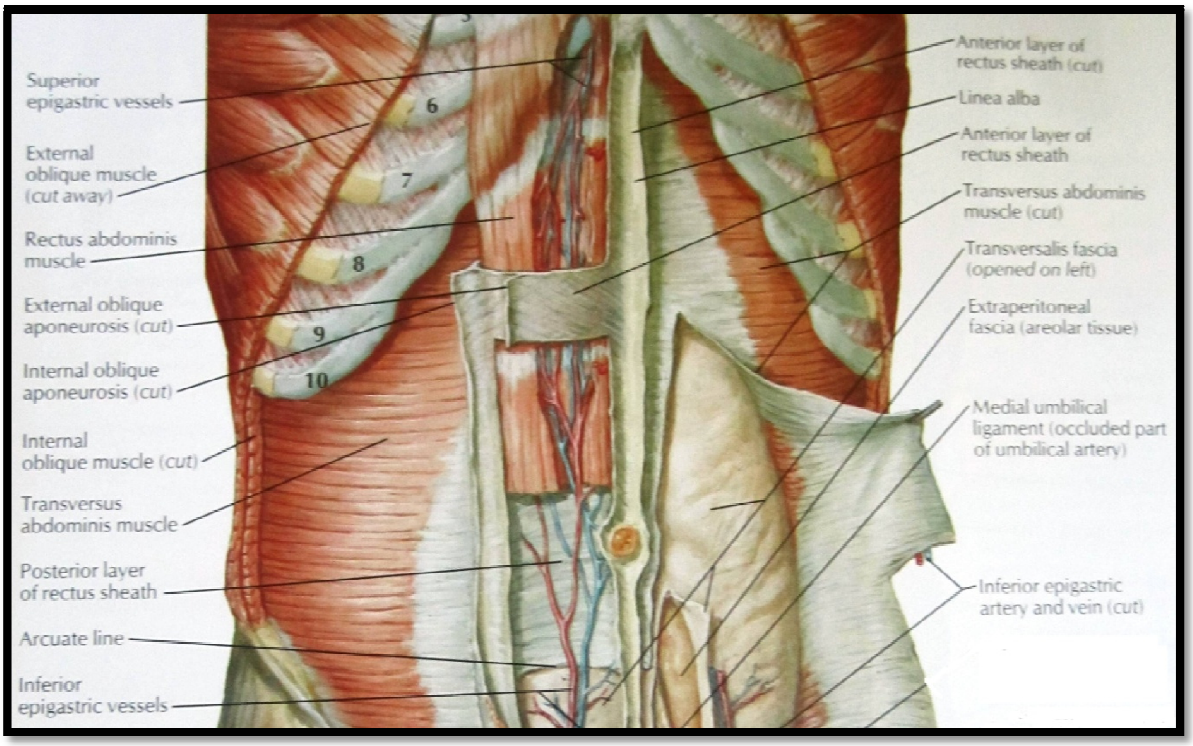


FIGURE 2 : MUSCLES OF ANTERIOR ABDOMINAL WALL (DEEP SECTION)



I) SKIN

Langer's line runs in transverse direction. Incision parallel to Langer's line seems to heal with a narrower & more cosmetic sear because of minimal forces pull the skin edges apart.

Longitudinal or oblique incisions heal with comparatively by broader scar because they cut across the line of tension.

II) SUPERFICIAL FASCIA

Below anterior superior iliac spine it contains superficial fatty layer of camper fascia and deep membranous layer of scarpa.

There is no deep fascia in abdomen in order to facilitate movements of respiration.

III) MUSCLES

Three pair of broad flat muscles they are the following,

a) External oblique muscle

It originates from lower ribs and courses downwards and forwards medially inserts into iliac crest to public tubercle.

b) Internal oblique muscle

It originates below from lateral 2/3rd of inguinal ligament, iliac crest and intermediate lip of iliac crest and course opposite to external oblique muscle.

FIGURE 3: CROSS SECTION OF ANTERIOR ABDOMINAL WALL (ABOVE ARCUATE LINE)

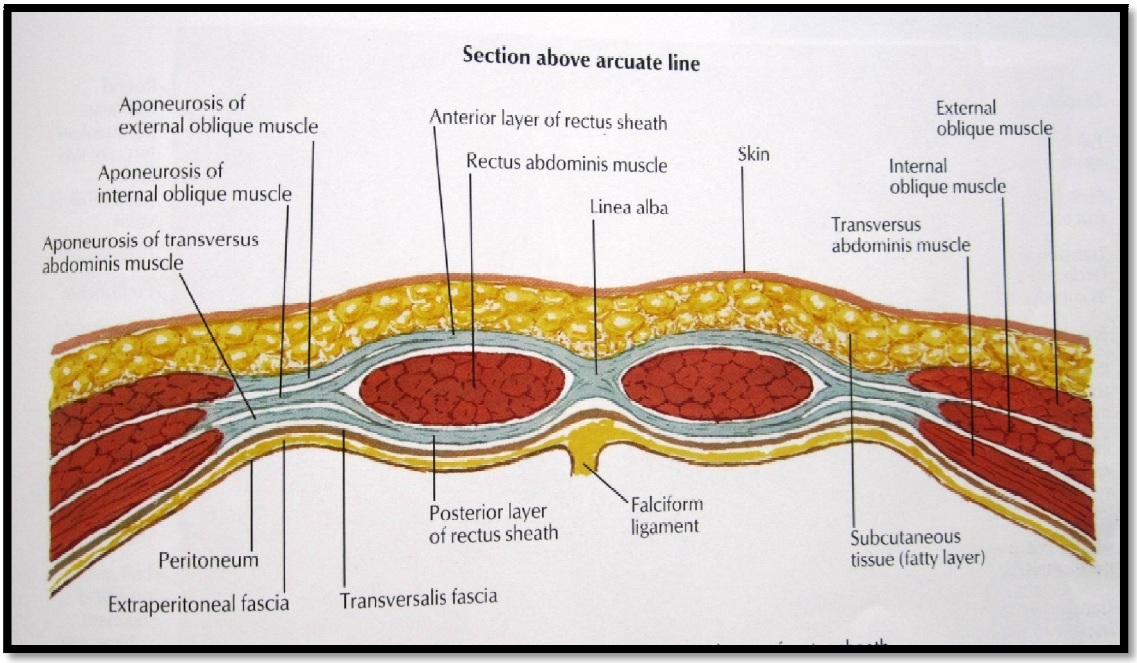
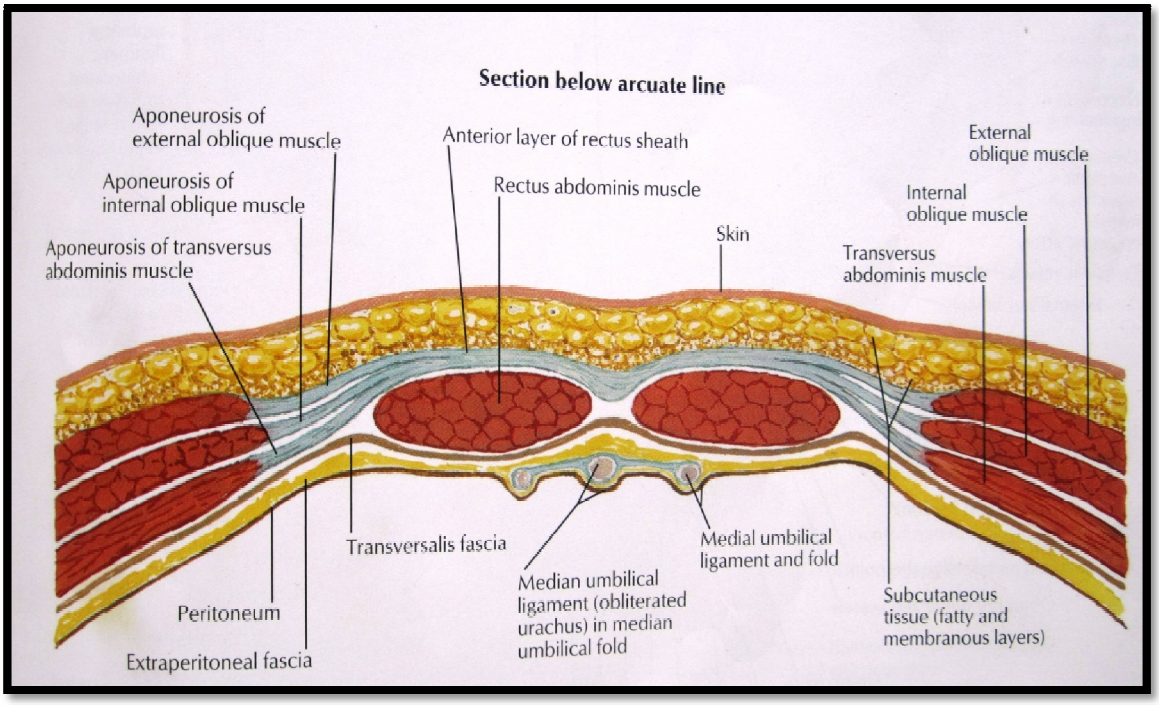


FIGURE 4: CROSS SECTION OF ANTERIOR ABDOMINAL WALL (BELOW ARCUATE LINE)



c) Transverse abdominis muscle

It originates below from inguinal ligament, thoraco-lumbar fascia and the lower six ribs.

Inserts into Conjoint tendon, forms an aponeurosis & merges with linea alba.

d) Rectus abdominis muscle

Two muscles lie edge to edge in the lower part but broader out above, and separated from each other by linea alba. Typically 3 intersections are found in the muscle at umbilical, xiphi sternum and one between them. The muscles are formed by fusion of mesodermal somites indicated by regular segmental innervations. At tendinous intersection the fibers blend inseparably with the anterior layer of rectus sheath thus prevents retraction of rectus in transverse incisions. The muscles may be retracted laterally but not medially because of segmental nerves enter through later border.

IV) RECTUS SHEATH

It is an aponeurosis which envelopes the rectus abdominis muscle one each side of line alba, acts as a retinaculum and prevents muscle from bow-stringing.

V) TRANSVERSALIS FASCIA

It covers the deep surface of transverses abdominal muscle and forms a complete facial envelope around abdominal cavity. This general fascia serves to bind together the muscle and aponeurotic fascia into a continuous layer and reinforce week areas.

VI) LINEA ALBA

It is a strong midline fibrous structure between the two recti, produced by interlacement of aponeurotic fibers of three flat muscles of abdomen. Which is attached to xiphoid above and public symphysis below, widened above the umbilicus (1 cm) but below the umbilicus it is difficult to recognize.

Nerve supply

Nerve supply of the anterior abdominal wall is segmental and related to specific spinal levels. The motor supply to the rectus abdominis muscles, the internal oblique, and the transverses abdominis muscles run from the anterior spinal rami of the T6 to T12 levels. The overlying skin (sensory) is supplied by afferent branches of the T4 to L1 nerve roots.

FIGURE 5: ARTERIES OF ANTERIOR ABDOMINAL WALL

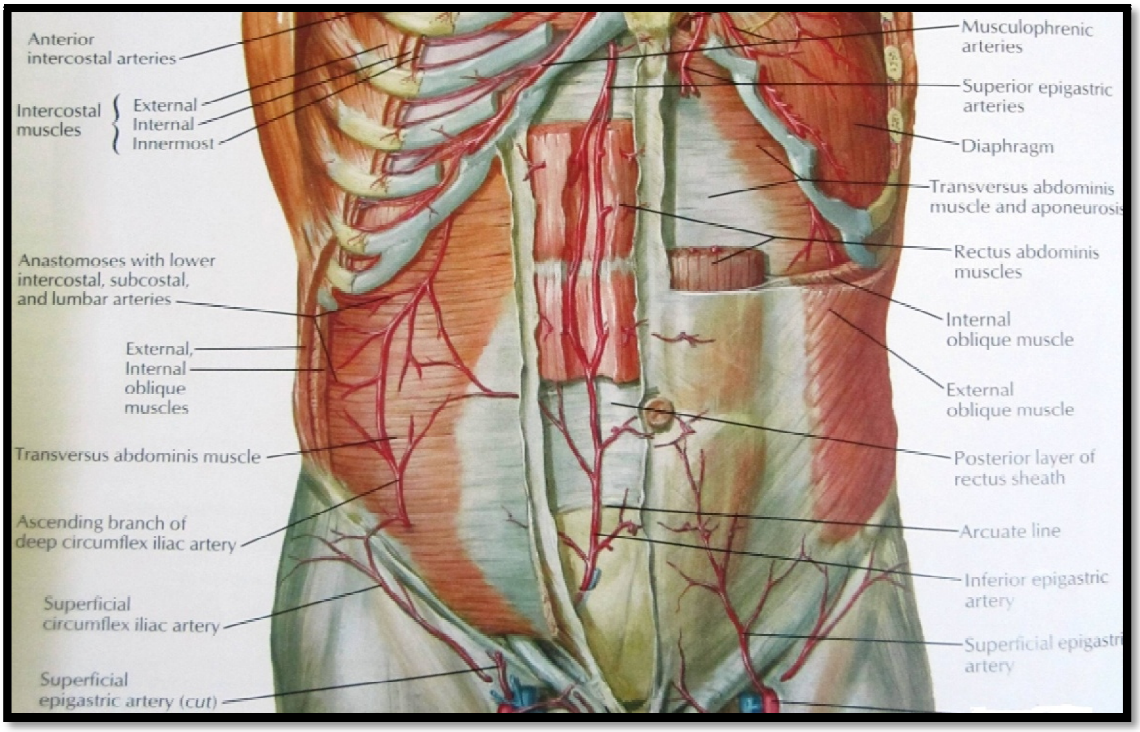
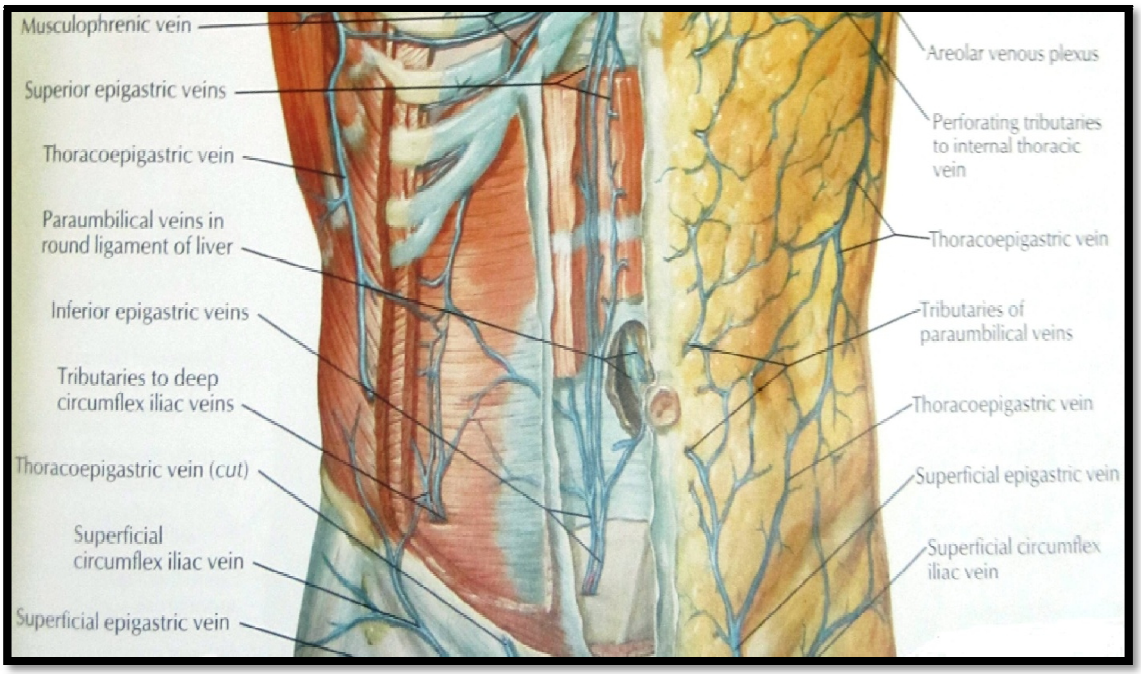


FIGURE 6: VEINS OF ANTERIOR ABDOMINAL WALL



Blood supply

Superior epigastric and inferior epigastric arteries are the major arteries supplying the anterior abdominal wall.

Superior epigastric artery: It is a branch of internal thoracic artery.

Inferior epigastric artery: It is a branch from the external iliac artery.

Subcostal & lumbar arteries also contribute to the blood supply of abdominal wall through its collateral branches.

Neurovascular bundle mainly lie in between the transverse abdominis and internal oblique muscle and within rectus sheath, it passes between the posterior aspect of rectus abdominis muscle and posterior wall of rectus sheath.

Lymphatic drainage

The lymphatic drainage of the anterior abdominal wall is mainly to the major lymph nodes in the superficial inguinal and axillary regions. Area above the umbilicus is draining into axillary group of lymph nodes and the area below the umbilicus is draining into superficial inguinal lymph nodes.

INCIDENCE OF INCISIONAL HERNIA[1,2,5,17]

The incidence of Incisional hernia varies and occurs from 2 to 13 % of all patients undergoing elective or emergency abdominal operations for various reasons.

In Donaldson and colleagues study found only one case of Incisional hernia in 231 Laparotomies. In Regnard (1988) study shows 13% at 5 years of which 80 % occurs in the first 2 years. Shouldice clinic in Toronto documented in a series of 500 Incisional hernia showed that the incidence within 6 months was 52.2%, and the one year incidence was 67.8%, and the 2 year incidence was 78.6%, 88.4% of Incisional hernia occurs within 3 years. 93.2% occurs in 4 years and almost 97% of Incisional hernia occurs within the five years.

Lamont (1998) reported the incidence of 6% after freshly made incisions, 12% after reincisions and 44% after repair of Incisional hernia at 5 years. Hasselinic (1993) in his study of 417 patients who underwent Incisional hernia repair showed the recurrence rate of 36% after 34.9 months and the recurrence rate of 41% after 5 years.

A study conducted by Kadar N in 1993 reported the incidence of Incisional hernia is about 3.1% after major laparoscopic gynecological procedures in the 12mm extra umbilical port site and 0.23% in the 10mm extra umbilical port site.

Factors such as obesity, diabetes, wound infection, and lower abdominal incisions had higher incidence of Incisional hernia and recurrence after repair. Another important factor which predisposes to increased recurrence of Incisional hernia was size of the hernia. Hernias less than 4cm wide had recurrence rate of 25% while more than 4cm recurred in 41% of the patients.

ETIOLOGICAL FACTORS FOR INCISIONAL HERNIA[4,5,7,10]

Etiological factors can be divided into

1) Pre operative factors
2) Per operative factors
3) Post operative factors

PRE OPERATIVE FACTORS

Obesity, diabetes mellitus, malnutrition, advanced age, renal disorder, steroid therapy & immune compromised state.

PER OPERATIVE FACTORS

- Type of surgery
- Type of incision
- Suture material used
- Suturing techniques
- Use of drainage tube

POST OPERATIVE FACTORS

Wound infection being the most common factor suggested by many authors.

Post operative pulmonary complications & increased intra abdominal pressure are other factors associated with increased incidence of Incisional hernia.

HYPOTHESIS OF INCISIONAL HERNIA FORMATION[4,5,7,8,9,10]

URSHEL & CO

Fascia under stress has increased DNA & protein by fibroblast and these continue for a long time.

Phases of wound healing

i) Substrate phase (1-4 days)

Exudative /inflammatory phase

ii) Fibroblastic phase (5-20 days)

Proliferative phase, connective phase, incremental phase

iii) Differentiation phase (21st day up to years)

remodeling, resorptive or plateau phases.

Possible interruption of a process at a time remote from the apparent healing of wound may lead to fascial weakness.

PRE OPERATIVE CAUSES

1. Obesity

It is associated with high percentage of Incisional hernia as well as recurrence following repair of these hernias (3-fold increase) by

- Increase intra abdominal pressure
- Stretches abdominal wall
- Fat hard to suture & tends to bleed easily, breakdown inhibits wound healing and raises rejection rate.

2. Diabetes mellitus

It is associated with

i) Decreased inflammatory response

ii) Increased wound infection rate

3. Smoking

Smoking will inactivate anti proteases, so the resultant protease and elastase will destroy the collagen and elastin of rectus sheath and transversalis fascia. This leads to hernia formation.

Post operative atelectasis and pulmonary infection causing cough which leads to increased intra abdominal pressure resulting in hernia.

4. Steroid therapy

It will inhibit fibroblasts capillary proliferation; decrease the inflammatory response, impaired formation of granulation tissue. This leads to Incisional hernia formation.

5. Malnutrition

i) Anemia

Delivery of inadequate oxygen, so poor wound healing.

ii) Ascorbic acid deficiency

Inhibition of collagen synthesis leads abnormal formation of fibers & formation of Incisional hernia.

iii) Hypoprotinemia

6. Multiple pregnancies

There is increased incidence of Incisional hernia in multiparous women compared to others.

PER OPERATIVE CAUSES

1. Nature of surgery

Emergency or elective Laparotomies for perforative peritonitis, caesarean section, appendicitis, diverticulitis, bowel gangrene and intestinal obstruction are associated with higher incidence of Incisional hernia.

Laparotomy for intra abdominal malignancy, chronic inflammatory bowel diseases are associated with increased incidence of Incisional hernia.

Duration of surgery and number of surgery the patients had undergone also related to occurrence of hernia. Relaparotomy is associated with more number of Incisional hernias.

2. Type of incision

Midline incision – 70%

Transverse incision – 12% (if they cross linea alba)

Oblique incision – 12 % (Cholecystectomy & appendicectomy)

Vertical incision

Para median / lateral para median has decreased number of Incisional hernia because of wide shutter mechanism.

Lower midline incision is associated with more Incisional hernia than upper midline incision because of –

1. Absence of posterior rectus sheath
2. Greater effect of gravity on the lower abdomen.

Para rectus incision

A vertical para rectus incision along the outside of the lateral border of the rectus sheath divide the intercostal nerves and vessels leading to weakness of the tissue medial to the incision and leading to increased incidence of Incisional hernia formation.

Transverse incision

Suture closure places suture materials around fascial fibers. On contraction the fibers are opposed and the suture material would realize minimal laterally directed tension.

Ellis and co

Midline incision is performed frequently in emergency surgeries like hemorrhage, trauma and sepsis.

These conditions may face the greater influence on the development of hernia through the type of incision.

Oblique incision

When the intercostal nerves are damaged as in case of subcostal incision and incision for renal exploration the muscles atrophy and predispose to hernia formation.

3. Suture materials

Mechanism of wound healing is important to know the importance of suture materials and its prevention of Incisional hernia.

- No tensile strength in the wound during the 1st week.
- Rapid increase in strength of the wound in 70 days after surgery.
- Maximum strength of the wound is attained in the first year, the original strength before surgery cannot be attained.

So during early phase of wound healing suture material does, in fact play an important role in maintaining the integrity of the wound closures and there is no role for absorbable suture materials (catgut, polyglycolyte) for abdominal wall closure.

Ideal suture material

Ideal suture material would be a non absorbable, mono filament with retention of high tensile strength. Monofilament sutures are inert; they do not act as a site for infection. So non absorbable, monofilament suture material is associated with less incidence of Incisional hernia.

3. Technique of wound closure

Table 1: Mass closure Vs Layered closure

Mass closure	Layered closure
Wide bite a minimum 1cm from the wound edges and placed at interval of 1 cm is ideal.	Taking too many sutures lead to strangulation & necrosis compared to mass closure.

Continuous versus Interrupted

Continuous suture disperses suture tension along the length of incision.

Interrupted sutures – tension is different at each suture that may lead to fascial necrosis if tied too tightly and poor approximation if tied too loosely.

5. Length of suture material

According to Jeinke's formula for ideal closure of the abdominal wound without tension and risk of wound dehiscence or Incisional hernia the length of suture material should be at least four times the length of the wound (4: 1ratio).

POST OPERATIVE CASES

1. **Hematoma**

It acts as a nidus for infection that in turn increases the incidence of Incisional hernia. Dead space drainage and obliteration of the dead space will prevent any collection & it will decrease the wound infection.

Wound tension is one of the factor decides fate of wound healing, excessive wound tension leads to ischemia and necrosis, which predisposes to hernia formation. Abdominal drain through main wound increases contamination and infection.

2. Wound infection

Most common factor suggested by many authors. By releasing collagenases, fibrinolysins, haemolytic and coagulase enzymes the tissue strength decreases resulting in hernia.

Bucknail and colleagues in their study found that the presence of wound infection was associated with fivefold increase in the rate of developing Incisional hernia (23%) compared with uninfected wound (4.5%).

3. Post operative pulmonary complications

Conditions which increase intra abdominal pressure in the immediate post operative period like consolidation, pulmonary embolism,

obstructive lung disease and restrictive lung diseases are associated with increased incidence of Incisional hernia.

4. Collagen abnormalities

Patient with Ehler-Danlos syndrome, Marfan's syndrome are likely suffer from multiple hernias and also at multiple sites.

5. Tissue failure

Aging and weakness of tissues and the increased intra abdominal pressure associated with chronic cough, constipation and prostatism are proposed etiological factor for the onset of Incisional hernia in the older age group.

CLINICAL PRESENTATION OF INCISIONAL HERNIA[2,4,5,7,10]

Incisional hernia represents a break down or loss of continuity of fascial closure. Incisional hernia presents no difficulties in diagnosis. The event is manifested as a bulge in the abdominal wall that is either visually seen or felt by direct palpation. There is great variation in the degrees of herniation. The hernia may occur through a small portion of the scar, rarely as a diffuse bulging of the whole length of the incision.

In obese, small fascial defects may be masked but symptoms of incarceration and strangulation may be there. In long standing cases the skin becomes atrophic and normal peristalsis may be seen, sometimes ulceration and necrosis of the overlying skin can occur.

Incisional hernia may be presenting with the following symptoms:

a. Bulge in the operation scar
b. Dragging type of pain
c. Abdominal discomfort
d. Sense of weakness and inability to work
e. Lack of security in the abdominal wall
f. Digestive problems like dyspepsia, vomiting and constipation
g. Bladder disturbance due to pressure on the bladder in case of pendulous hernia.

Maneuvers that increase the intra abdominal pressure, such as coughing, lifting the head or legs or assuming the erect posture make

them more prominent. Small uncomplicated Incisional hernias will be asymptomatic or have only minor or intermittent complications.

Occasionally patients with large hernias experience difficulty in bending, discomfort, persistent abdominal pain or even intermitted intestinal obstruction. As with other hernias incarceration or strangulation is much more common if the neck of the hernia defect is narrow.

In strangulation of the hernia, the symptoms of intestinal obstruction and ischemic bowel will supervene, mild attack of incomplete obstruction presents as colicky pain and vomiting. One dreaded complication of Incisional hernia is spontaneous rupture with evisceration.

The presence of the Incisional hernia is apparent on clinical examination. The main clinical finding is the presence of a mass. If the mass is pushed inside the defect may be palpated in the rectus sheath, if the mass is irreducible the estimation of the defect is difficult especially in obese patients. The mass may be large or small, reducible or irreducible.

The contents may be either bowel or omentum. Sometimes both are matted together and are often adhered to a loculated peritoneal sac, so that the hernia is partially or completely irreducible. Sometimes a skin overlying it is so thin and atrophic so that normal peristalsis can be seen in the underlying tissue.

INVESTIGATIONS FOR INCISIONAL HERNIA

Most of the patients present with Incisional hernia will be having other medical complications like diabetes, hypertension, obesity and hypercholesterolemia, so general medical evaluation should be done in all patients.

Before going to definitive surgical repair of Incisional hernia any other intra abdominal pathology must be excluded by doing the ultra sonogram of abdomen. Content of the hernia, size of the defect can be made also by ultra sonogram. CT and MRI scan provide excellent delineation of anterior abdominal wall, confirmation of equivocal hernias, diagnosis of complications such as bowel obstruction and ischemia.

X-rays and barium study will demonstrate hernia containing bowel and bowel related complications.

TREATMENT OF INCISIONAL HERNIA[2,3,5,7,10]

It have been suggested that the delay in surgery may lead to unnecessary complications and difficulty during hernia repair with an associated increase in the recurrence rate of about 20-40%.

In a retrospective study of 206 patients undergoing Incisional hernia repairs Read and Yonder reported that the indication for repair in 17% of patients was management of incarceration or strangulation. There is higher mortality for repair of complicated hernia (1.1%) than in those individuals elective repair (0.3%)

Over the last several years, number of new techniques for hernia repair has been introduced. A growing experience with these innovative techniques suggests that the rate of recurrences after repair of an Incisional hernia may be reduced. The recognition of these may prompt surgeons to repair Incisional hernia at an earlier date, prior to onset of severe symptoms.

The management of Incisional hernia is discussed under following headings:

1. Preoperative preparations
2. Operative procedures
3. Post operative management

1. PREOPERATIVE PREPARATIONS

The surgeon's first responsibility in the management of Incisional hernia is to avoid creation of another Incisional hernia. In order to obtain a long lasting repair to prevent post operative complications some special preparation is required before surgery

a. As far as possible postpone the surgery till all the precipitating factors for Incisional hernia are corrected.

   Example: Respiratory problem, urinary obstruction and chronic constipation.

b. In obese patients weight reduction by dieting and exercise should precede the operation.

c. Strict control of systemic illness like diabetes, hypertension and renal disorders is necessary before surgery.

d. Nutritional factors like anemia, hypoproteinemia and vitamin deficiencies should be corrected.

e. Some of the following exercise are to be taught to the patient to prevent post operative complications

   Example: Breathing exercise to prevent pulmonary complications, leg exercises to prevent DVT.

In dealing with large Incisional hernia or irreducible hernia, pre operative pneumoperitoneum may be beneficial. Patients with massive hernias, which have to significantly reduced the intra abdominal pressure and abdominal musculature, has undergone severe wasting can no longer yield sufficiently to permit replacement of the viscera within the abdomen. So those are the cases for preoperative progressive pneumoperitoneum.

Pneumoperitoneum is produced by placing a catheter in peritoneal cavity and introducing air daily to the limit of tolerance, in which intra abdominal pressure is raised to 15-18 cm H_2O for up to several weeks preoperatively until the abdomen and hernia are blown up as tight as a drum. If the hernia consists largely of scar, it has little elasticity so that healthy abdominal wall begins to bulge almost at once while the air displaces the hernia into the abdomen. At the same time there is some amount of depression of pelvic floor and a gradual elevation of diaphragm. This technique employed carefully and correctly can enable a primary repair to be successful.

Advantages

i) Abdominal wall is gradually stretched

ii) Hernial sac and adhesions are stretched

iii) Increased tone of diaphragm

iv) Pre operative respiratory and circulatory adjustments to a raised diaphragm

Complications

1) Subcutaneous emphysema
2) Hemorrhage
3) Air embolism
4) Bowel perforation

Contraindications

i) Abdominal wall infection

ii) Strangulation

iii) Congestive cardiac failure

2. OPERATIVE PROCEDURES

INDICATIONS:

The following are indications for repair of Incisional hernia

i) Incisional hernia that produce discomfort and pain to the patient

ii) Irreducible hernia

iii) Narrow neck of defect

iv) Obstruction

v) Strangulation

Many Incisional hernias produce symptoms of pain and discomfort. Sometimes it produces recurrent colic if sub acute

obstructive episodes occur. Such symptoms are reason enough for operative intervention. Irreducibility and narrow neck are further indications for surgery. Obstruction and strangulation are absolute indication for immediate surgery.

CONTRAINDICATIONS:

i) Extreme obesity

ii) Uncontrolled diabetes

iii) Cardio respiratory decompensated patients

iv) Skin infections and intertrigo

v) Continuing deep sepsis in the wound

General operative techniques:

- Incision must be sound, preferably transverse incision along the langer's line
- Avoid too much retraction of muscles
- Avoid undue tension in wounds
- Ensure meticulous hemostasis
- Selection of suture material must be appropriate
- Suture material should not be crushed
- Bowel handling must be minimum to avoid ileus
- Place the drains and colostomies away from the main incision

- Avoid the wound infection by strictly following aseptic principles
- Avoid the wound infection also by meticulous preparation of the patient, theatre and instruments used for surgery and with judicious use of antibiotics.

Three basic techniques of Incisional hernia repair

i) Primary tissue repair

ii) Shoe lace darn repair

iii) Synthetic non-abnormal mesh closure

PRIMARY TISSUE REPAIR

Likely hood of adequate long lasting repair can be increased by adherence to specific surgical principle. These include proper placement of sutures in the fascia, usually the surgeon tries to incorporate the old scar in the repair. The skin and subcutaneous tissue are dissected away from hernial sac, isolation of healthy fascia can done a few centimeters from the defect and abdominal cavity entered through the virginal area.

Another approach includes direct entrance into the peritoneal cavity through the hernial sac and identification of the fascia after the adhesions from intra abdominal organs have been taken down from the fascial defect. Ultimately the superficial and deep surfaces of the fascia should be exposed for a distance of at least 3-4cm away from the

circumference of the defect. The hernial sac, which typically represents attenuated fascia and peritoneum usually, is excised prior to repair. Experience suggests the fascial sutures are the best placed in 1cm away from the edge and 1cm apart. This strategy provides for incorporation of the healthy fascia on either side of the edge and should avoid protrusion of abdominal contents through the fascia by making small advancement of the sutures along the length of wound.

Fascial necrosis must be avoided; this can be achieved opposing the fascia without tension and tightening the sutures only enough to bring the edge into approximation. The appropriate suture size should be selected so as to handle the anticipated tension of wound and minimize the likely hood of fracturing of the sutures. Finally appropriate knot tying can prevent suture unraveling.

Modified mayo technique

In which fascia edges were overlapped typically provides a satisfactory outcome.

Keel procedures

In which relaxing incisions are made in the lateral aspect of the anterior rectus sheath. This allows the medial aspect of the anterior sheath to be approximated in the midline; it is especially useful for large upper midline hernias.

Nuttal procedure

For lower midline defects, rectus abdominis muscle and enveloping fascia are mobilized off the pubic bone and approximated in the contra lateral bone. This maneuver provides anterior rectus sheath coverage for lower midline defect.

SHOELACE DARN REPAIR

Basic step is to reconstitute the strong new midline which anchors the flat muscles by reconstructing a new linea alba, which can be done by suturing together a strip of fascia from the medial edge of each anterior sheath. The second step is to restore the rectus muscle back to their former length by drawing closer together the lateral cut edges of the anterior rectus sheath where medial strips were split off. This step is accomplished with a continuous suture of heavy monofilament nylon that passes to and fro between the cut edges and that also substitutes functionally and anatomically for missing anterior rectus sheaths.

Sac remains unopened throughout the operation. If it is opened accidently then it is closed with a synthetic absorbable suture material.

PROSTHETIC MESH REPAIR

The use of sheets of non absorbable synthetic mesh prosthesis placed in abdominal wall defects has revolutionized the repair of Incisional hernia and rendered obsolete most of the old types of

operations. It is an excellent method of repair of large postoperative hernias and is universally used.

ONLAY Mesh repair

Here after separating and excising the sac, it was closed with absorbable suture materials. Then midline closed with non absorbable suture material. After removing the anterior rectus sheath of its fat and after achieving complete hemostasis mesh is placed over it and sutured with the rectus sheath.

Two layer prosthetic tissue replacement

It is used in large Incisional hernias, where the defect cannot be approximated without causing excessive tension.

Procedure

Subcutaneous plane superficial to musculo-aponeurotic plane of abdominal wall and extra peritoneal plane immediately internal to the wall are dissected for at least 6-7cm back from the margin of hernial orifice.

A piece of expanded Polytetra Fluoroethlene sheet prosthesis about 6cm wider in all dimension than the hernia orifice is placed in the pre peritoneal space and mattress sutures are put with 1-0 prolene at 1cm from its margin. The external layer of polypropylene mesh prosthesis similar in size to the internal ePTFE prosthesis layer is placed over the defect and fixed all around.

Use of absorbable mesh in hernia repair

It is only used in case to avoid contact of non absorbable mesh with the viscera where peritoneum cannot be closed.

UNDER LAY mesh repair

In this method, after excising the sac and releasing the adhesion, mesh placed either deep to the peritoneum or above the peritoneum.

- Sub fascial placement of mesh
- Intra fascial placement of mesh

Cuff technique

Hernia edges are reinforced by wrapping the edges with mesh on both sides after which reinforced edges are approximated each other.

Marlex – Peritoneal sandwich

The prosthetic sheet of polypropylene mesh is implanted between two layers of tissues like a sandwich. The sac and scar tissue are opened in midline and the adherent bowel and omentum are dissected from inner surface. The cut edge of the flap is then sutured to the medial edge of opposite rectus sheath to close the abdominal cavity.

The sheet is laid down on the anterior surface on the flap, and is sutured to the medial edge of the rectus sheath on its ipsilateral side. The mesh then covered by the second half of sac.

Disadvantages

This procedure is time consuming and does not reconstruct the normal anatomy and functional elements of the abdominal wall.

Rives-Stoppa technique

Mesh placed in plane behind the rectus muscles and lay on to the anterior aspect of the posterior rectus sheath.

Steps

- Sac is opened and peritoneum is closed with running absorbable suture technique.
- Rectus muscles are separated from the posterior rectus sheath up to the wide length of the lateral edge of the sheath.
- Mesh placed about 6cm from the lateral edge of the defect, above the superior edge to lie under the diaphragm. In lower abdomen below the arcuate line, it lies in the pre-peritoneal plane and should be long enough to be laid into the pelvis, and fixed all over.
- Two vacuum drains are laid on the graft and bought out.
- Two anterior rectus sheaths are then sutured together along their cut medial edges with non-absorbable monofilament suture.

Advantages

i) Graft is held placed by the natural forces for the intra abdominal pressure against the abdominal wall.

ii) Avoids slippage and recurrent hernia between graft and edge of the defect.

Laparoscopic Incisional hernia repair

Abdomen is entered through an area away from the hernia by means of one of two technique closed or by open method. Adhesions are released to free anterior abdominal wall.

Margins of hernia are delineated and cleared circumferentially, about a distance of at least 4cm. Hernia sac contents are reduced, peritoneal sac itself is left on situ. ePTFE mesh tailored to overlap all hernias margin by 3-4cm and introduced through 10mm trocar site and positioned.

PROBLEMS OF MESH IN VIVO

i) Shrinking of polypropylene mesh

Mesh that contains a lot of polypropylene content have a tendency of shrink post operatively so that is requires at least 3cm overlap from hernial defect to prevent recurrence. Meshes with big pores are less likely to fold and improve compatibility.

ii) Fixation of mesh

Herniation pressure, hydroxyproline concentration, mesh shape and number of fibroblasts, collagen fibers of tissue all act as an anchor zone.

There are two schools of thought whether to fix the mesh are not. But ideal and accepted method is fixation of mesh with non-absorbable sutures with 1cm gap between two sutures.

iii) Prevention of adhesion

Prevention of adhesion formation with sodium hyaluronate based bio-absorbable membrane.

Hyaluronate reduces the quality of grade of adhesions of both small and large bowel to polypropylene mesh without compromising strength of the repair.

Timing of repair

Incisional hernias assume an ovoid shape as it enlarges, because circle is more stable in resisting force.

The factors that enlarge small defect

1. Contracture of unopposed abdominal wall musculature
2. Intra abdominal pressure expanding the protrusion
3. Weight of the hernia content

Incisional hernia should be repaired upon when diagnosed to avoid the technical and physiological consequences and complication that occur due to delay.

Obstruction and strangulation

Obstruction and strangulation occur due to adhesion around the hernial orifice that kink or partially or totally occlude the lumen of bowel.

Skin ulceration

Steady enlargement of hernial contents brings about atrophy and displacement of subcutaneous fat and skin. Skin becomes quite thin and progressively more ischemic and ulcerates.

Loss of domain

These occur when unreduced viscera are present in an external hernia sac over relatively long period and abdominal cavity proper accommodate to the smaller volume of its residual content.

Mesh repair has now eliminated the need for

a. Pneumoperitoneum
b. Relaxing incision
c. Musculo-fascial flaps

POST OPERATIVE MANAGEMENT

It mainly consists of management of complications. Most of the complications are of a minor nature and many of them are conservatively easy to manage.

1. **Seroma**

It is the collection of serous fluid in the wound. When the collections are large and troublesome it should be aspirated under aseptic conditions. If it is a smaller one, it may disappear spontaneously.

2. **Hematoma**

Hematoma is formed by excessive collection of blood in the operated wound, obviously as a result of imperfect hemostasis. This should be evacuated under strict aseptic technique.

3. **Wound infection**

Obese patients, wide area of dissection, not following aseptic precaution, incomplete hemostasis are conditions favoring the development of infection. It should be treated with appropriate antibiotics. If necessary wound drainage irrigation is to be done.

4. **Abdominal wall sinuses**

This is mainly due to the implanted prosthetic material of suture material that subsequently becomes infected and forms chronic discharging sinuses. Early infection responds to conservative treatment but in few cases the infection will not cure until the mesh is removed.

5. **Pulmonary complication**

Complications like atelectasis, pneumonitis, respiratory embarrassment, pulmonary embolism can be prevented by daily chest physiotherapy,

breathing exercises, antibiotics, bronchodilators, and Fowler's position for relaxation of abdominal muscles.

6. **Venous thrombosis**

Venous thrombosis can be prevented by leg exercises, early mobilization and prophylactic heparin injection.

7. **Recurrence of hernia**

Poor surgical technique, inappropriate suture material, inadequate pre operative preparation, wound infection, obesity are the main causes for recurrence.

PROSTHETIC MATERIALS USED FOR INCISIONAL HERNIA REPAIR[1,2,5,7,9,10]

Historical development

Biomaterials are sometimes required to bridge or reinforce the natural and unnatural defects, abnormal wall, inguinal canal and also chest wall. They may be classified into:

1. Natural prosthetic biomaterials
2. Metal synthetic biomaterials
3. Non-metallic synthetic prosthesis.

Natural prosthetic biomaterials

1. Autogenous dermal grafts
2. Whole skin grafts
3. Dermal collagen hemografts
4. Procaine dermal collagen
5. Autogenous fascial heterograft’s
6. Lyophilized aortic homograft’s
7. Preserved Dural homograft’s
8. Bovine pericardium.

Some of these were used with fairly successful results, but their scarcity and in many cases cost limited its use. Hence they are not adopted widely.

Metal synthetic biomaterials

Use of metal synthetic biomaterials predated development of natural implants,

i) Silver filigree

ii) Tantalum gauge mesh

iii) Stainless steel mesh.

But these were difficult to handle in surgery and were associated poor resistance to infection, frequent abscess formation and recurrent herniation.

Silver filigree

Lack of pliability, tendency to become weak, accumulation of fluid around the material, wound infection and the subsequent sinus tract prevents its use in management of hernia. Metal prostheses are rarely used today in hernia repair because of concerns about structural integrity and allergic reactions.

Non metallic synthetic biomaterials

i) Nylon mesh

ii) Silastic

iii) Polytetra fluroethylene

iv) Carbon fiber

All these had significant drawbacks

Nylon mesh

Unreliable due to infection, had poor fibroblast in-growth, lost its strength due to hydrolysis and chemical denaturing in vivo.

Silastic

Mainly used in pediatric repair of omphalocele and gastrochisis adequate fibrous tissue in-growth was one of its advantages.

Polytetra fluroethylene

Not incorporated well into body tissue and not tolerant to infection.

Carbon fiber

Advantages include biocompatibility and formation of new connective tissue similar to ligament. Questions about the potential carcinogenicity have precluded its clinical use.

Current synthetic biomaterials

a) Polyester mesh
b) Polypropylene mesh
c) Expanded polytetra fluroethylene mesh

Ideal characteristics of synthetic biomaterials

- No physical modification by tissue fluids
- Chemically inert
- Does not produce inflammatory, foreign body reaction or hypersensitivity reaction

- Non carcinogenic
- Can be fabricated to any forms or shapes without loss of its strength
- Resistance to mechanical stains
- Can be sterilized by autoclaving or disinfectants

Polyester mesh (Dacron, mersilene)

This prosthesis is supple and elastic, confined to visceral space, has a grainy texture to grip the peritoneum and prevent slippage, and is sufficiently reactive to induce rapid fibroblast response to ensure fixation.

Polyprolylene mesh (marlex, prolene)

Usher and co in 1958 introduced polypropylene mesh in Incisional hernia repair.

The **advantages** are –

- In purulent infection granulation tissue growth through the mesh without sloughing or sinus tract formation.
- Inhibit bacterial entrapment
- Tensile strength retained indefinitely
- Soft pliable and easy to handle
- Can be autoclaved, trimmed in operating room
- Interstices allow for prompt fixation by collagen

Because of all the above nature polypropylene mesh is the most commonly used prosthesis in Incisional hernia.

Disadvantages

Mesh when placed close to bowel can lead to

i) Fistula formation – mesh when in contact with bowel may erode into the bowel forming an entero-cutaneous fistula.

ii) Obstruction

Expanded polytetra fluro ethylene

i) Minimal inflammatory reaction occurred with ePTFE

ii) It can be placed safety over the bowel without formation of fistula, obstruction

iii) Orderly orientation of scar tissue adjacent to the patch

iv) Apparent normality of patients' abdominal wall in contrast to thickening and rigidity that follow the use of others.

Disadvantages

i) **Infection :** There is increased risk of infection compared to suture repair alone because of the foreign material decreases body immunity.

ii) **Seroma formation:** Increased incidence of seroma formation compared to suture repair only because of sensitivity of the mesh.

iii) **Biomaterial related intestinal obstruction :**

Intestinal obstruction can occur because of the contact with the abdominal viscera and formation of inflammatory bands.

TECHNIQUE OF OPEN MESH REPAIR (ONLAY)[1,2,5,10]

Principles of repair

a. No tension

Tension in a hernia repair is the principle cause of failure of wound healing due to formation of thin scar that does not adequately resist increased intra abdominal pressure.

b. Bowel should not be exposed to synthetic mesh

Synthetic mesh initiates an intense inflammatory reaction that mature as dense sheet of scar. If bowel is exposed to prosthesis, it becomes adherent to the scar and pre disposes to obstruction.

Antibiotic prophylaxis

The presence of prosthesis within a wound disables normal host defense mechanisms that protect against the low level of bacterial contamination that occurs with every surgical wound. To decrease the wound infection broad spectrum antibiotic is administered intravenously about 30 minutes before the skin incision in order to get maximum antibiotic concentration at the time of surgery.

OPEN INCISIONAL HERNIOPLASTY

FIGURE 7: HERNIAL DEFECT AND SAC

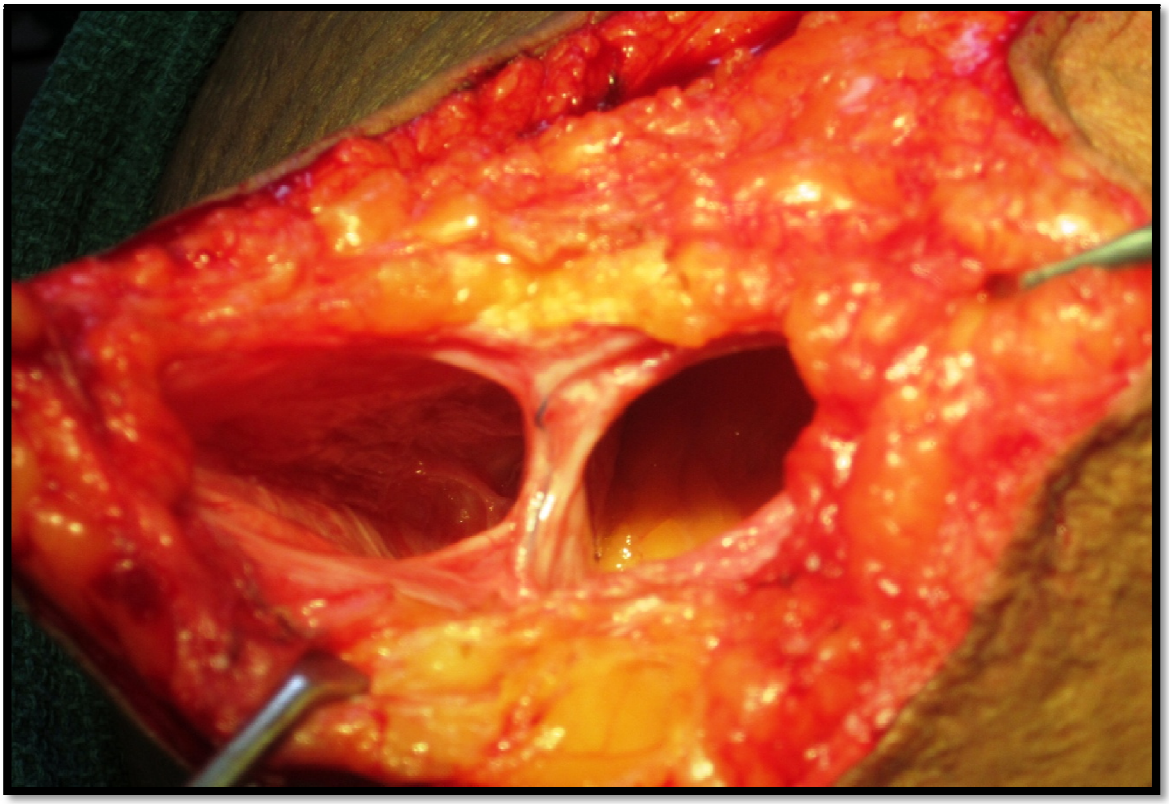
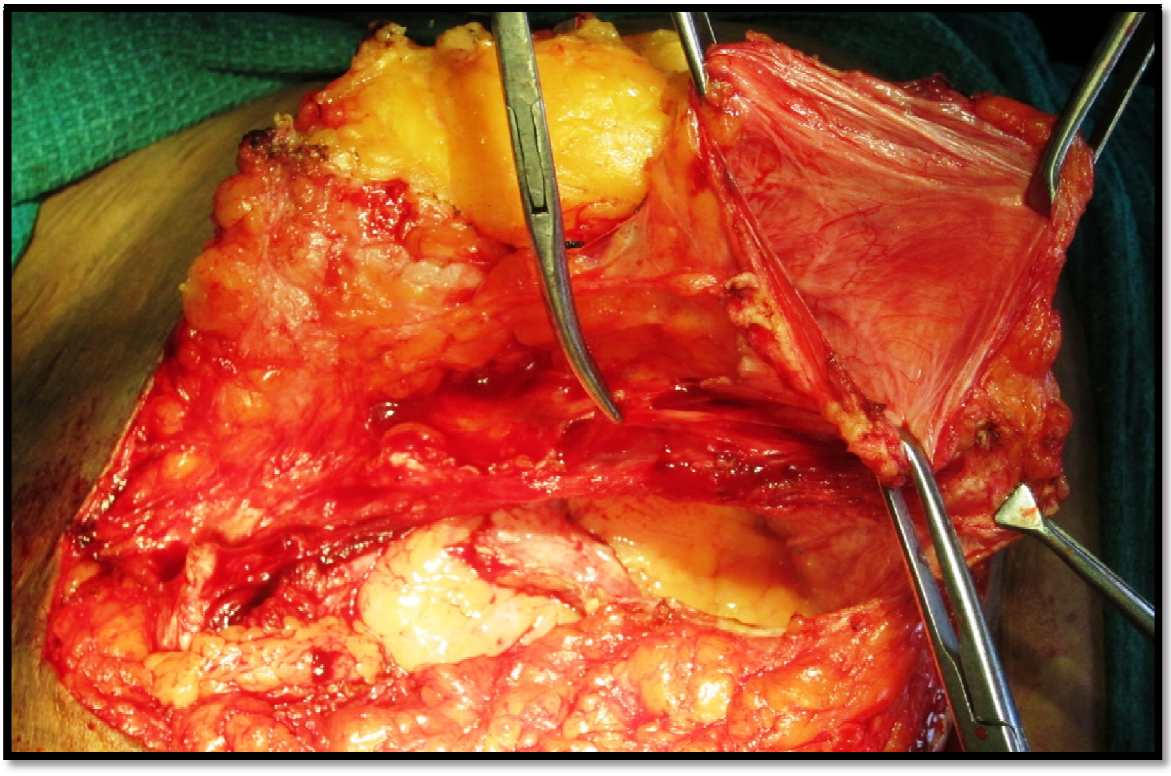


FIGURE 8 : DISSECTION OF HERNIAL SAC



Procedure

Urinary bladder catheterization and naso-gastric tube insertion is done for all cases. Most of the cases are operated under spinal anesthesia and rest of the cases under general anesthesia.

Incision

Elliptical incision excising the previous abdominal scar is made. Abdominal wall is reopened under it and skin incision is extended above or below if needed.

Excision

Skin and subcutaneous flaps dissected and peritoneal sac is opened and the adhesions present to the parietal wall or in between the two viscera are released. Excess sac is excised and the peritoneum closed in the midline with absorbable suture materials. After opening of sac mostly the omentum is found as content and due to adhesions omentectomy is added to remove the diseased structure.

Simultaneously any intra abdominal pathology diagnosed is treated.

Dissection of flaps

Skin and subcutaneous tissue overlying the hernial sac are initially dissected in the plane external to sac and deep to the subcutaneous fat until the muscle fascial border of the hernia are reached. The dissection is then continued on the surface of the fascia elevating the full thickness of

FIGURE 9 : CLOSURE OF RECTUS WITH PROLENE

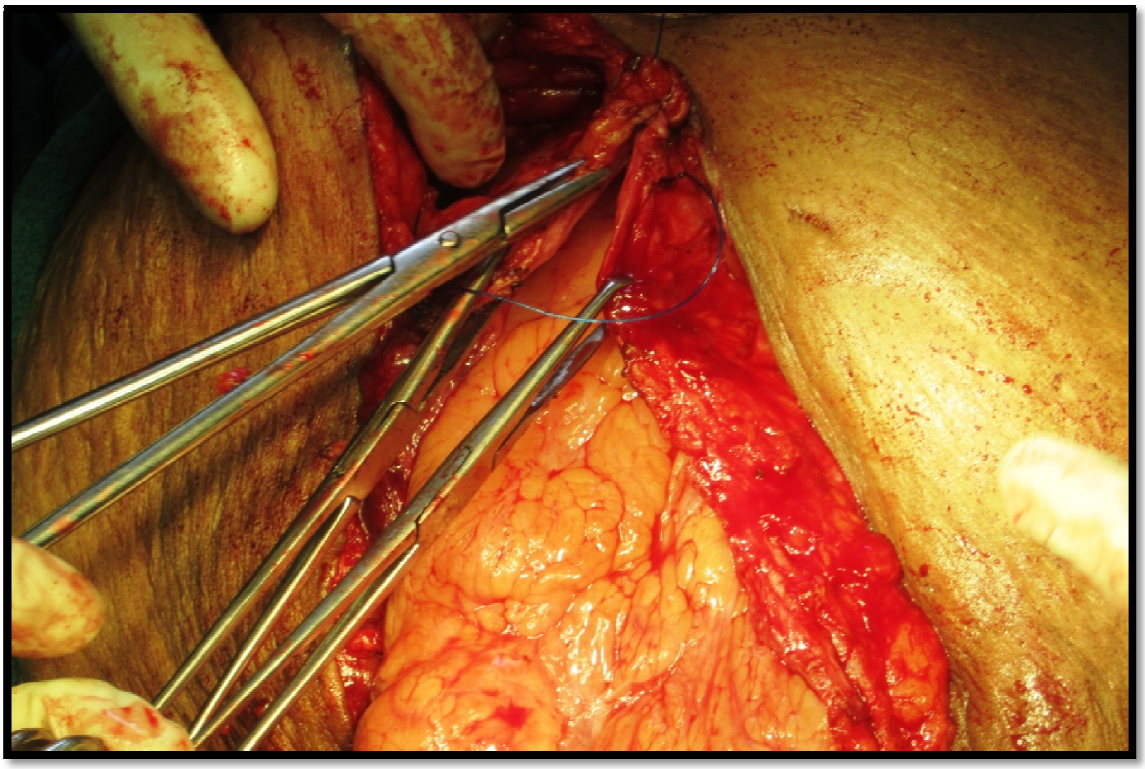
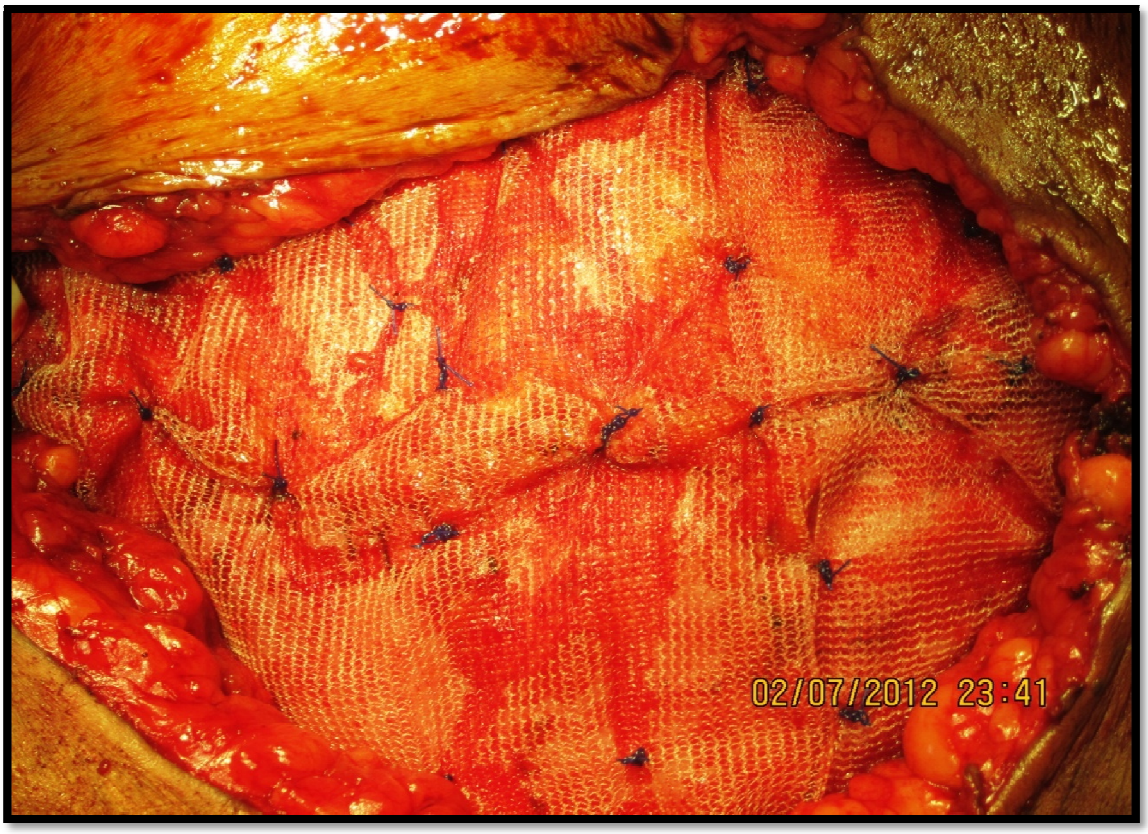


FIGURE 10: PLACEMENT OF PROLENE MESH



overlying skin and fat to a distance of 5 to 8cm from the margins of hernial orifice.

The rectus sheath completely removed of fatty tissue and hemostasis is obtained by cauterization of bleeding vessels to prevent hematoma formation and to facilitate fitting of prosthesis without infection.

Midline defect is closed with non absorbable suture material (prolene) by continuous manner without tension.

Placing of prosthesis

Polypropylene, monofilament knitted mesh about 15 x 15 cm used for repair is kept over the rectus sheath without tension and excessive folding.

Fixation of mesh

After placing the mesh over the rectus sheath it is fixed using 2-0 prolene all around about 1cm from its edge with the rectus sheath. Fixation is done by interrupted manner.

Two closed drains are placed over the mesh and fixed with the skin. Skin is closed with non absorbable suture material (silk or ethilon) or skin staplers.

Post operative period

- Oral fluids started after return of bowel movements.
- Catheter removed on the first post operative day and patient mobilized on the same day.
- Serial recording of drainage is done and suction kept until the drainage collection is nil in order to drain the foreign body induced reaction fluid, hematoma and complete the fixation with the rectus sheath. Suture removal is done usually on the 10^{th} day and if wound found healthy patient is sent home.

Post operative follow up

a. **Seroma:** Even the presence of suction drain patients developed seroma which can be treated conservatively with antibiotics and needle aspiration.

b. **Wound infection:** The presence of pus in the wound is taken as wound infection.

c. Wound gapping:

Disruption of skin and subcutaneous tissue with visualization of prosthesis is considered as wound gapping.

d. Pain and abdominal discomfort:

Some patients have chronic persistent vague pain over the repair site and feeling of hard substance over the abdominal wall.

TECHNIQUE OF LAPAROSCOPIC MESH REPAIR[3,5]

Introduction:

Principle of Rives-Stoppa open mesh repair for Incisional hernia is based upon tension free mesh placement in the retro-rectus plane i.e. in the plane between rectus muscle and the posterior fascia. The laparoscopic approach is different in the way that the mesh placement is in the intra-abdominal cavity and not in the retro-rectus plane. Laparoscopic repair allows a clear visualization of the abdominal wall, better mesh coverage beyond the defect, and secure fixation to healthy abdominal wall fascia. The possible mechanical advantage of the intra-abdominal location of mesh is that the intra-abdominal pressure may help to push the mesh against the abdominal wall. A generous overlap of the mesh also relieves some of the pressure off around the defect, allowing for medialization of the fascial edges of the defect.

Pre-operative planning:

Patient education regarding the benefits and complications like post-operative pain which may require hospital stay for pain management, postoperative seroma formation, extra incisions for suture fixation and the potential for bowel injury should be done. Explaining regarding bowel injury and its management is especially important for patients with multiple previous abdominal surgeries, multiple previous Incisional hernia repairs (especially with mesh), and very large defects. For patients

LAPAROSCOPIC HERNIOPLASTY

FIGURE 11 : SYNTHETIC MESH USED IN LAPAROSCOPIC REPAIR

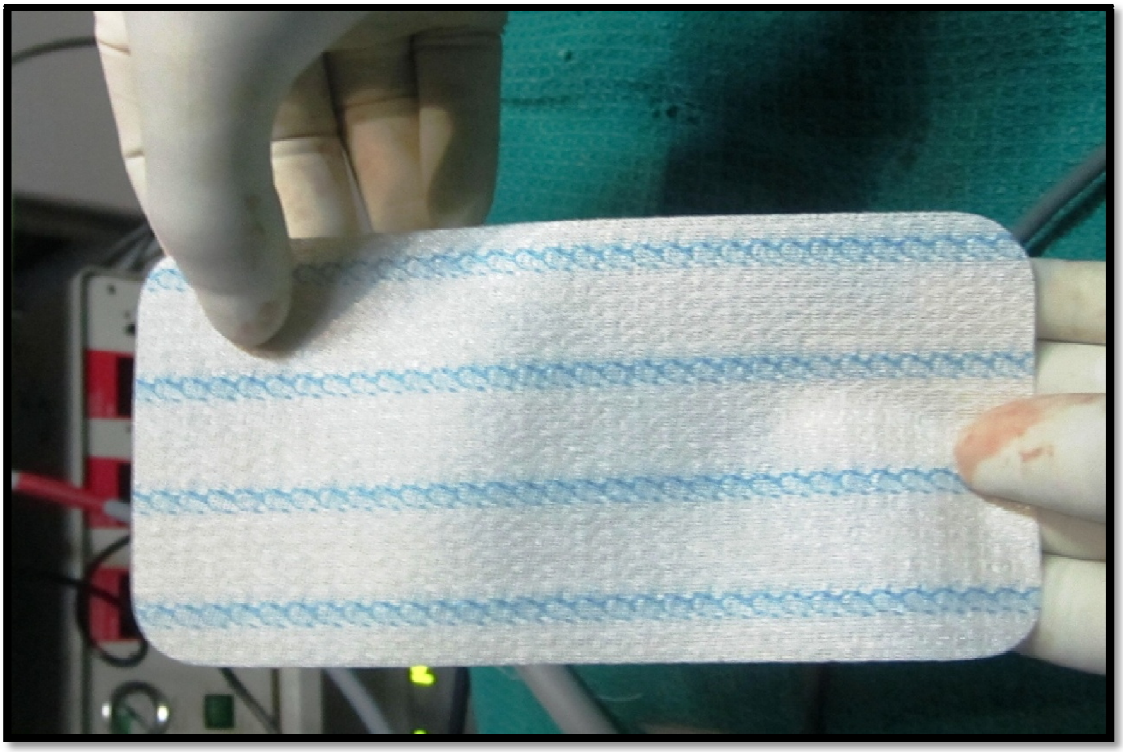
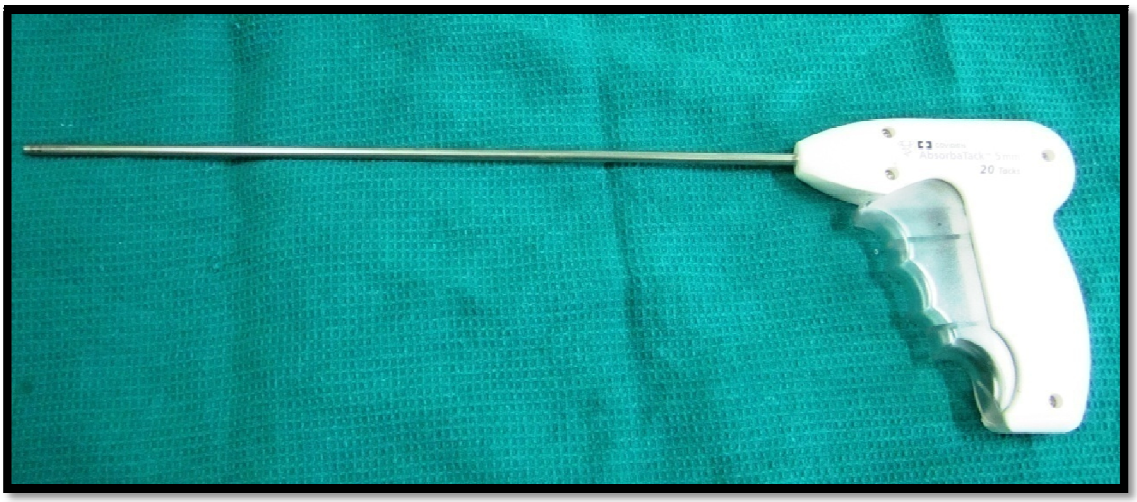


FIGURE 12 : TACKER USED FOR MESH FIXATION



with suspected loss of abdominal domain, discussion must include the likelihood of multiple surgeries, conversion to open repair, prolonged recovery, and even the possibility of death. There are several modalities; the first option is no surgery (conservative management with binders); second option is placement of an intra-abdominal port for chronic pneumoperitoneum, several weeks of injection of air to attempt to expand the true abdominal cavity, followed by delayed mesh repair (open or laparoscopic) after regaining some domain.

SURGICAL TECHNIQUE

Positioning and preparation:

The patient is placed in the supine position with arms tucked at the side or on arm-boards, depending on the size and location of the defect. For upper abdominal hernias, the monitors should be at the head end; for lower abdominal hernias the monitor is placed at the foot end. In case of midline hernias, the initial access ports are laterally placed, with additional trocars on the contra-lateral side of the surgeon. For hernias away from the midline, the surgeon stands on the side of the patient opposite the hernia, and the monitor is kept on the same side as the hernia i.e. opposite the surgeon.

FIGURE13: LAPAROSCOPIC VIEW OF HERNIAL DEFECT WITH ADHESION

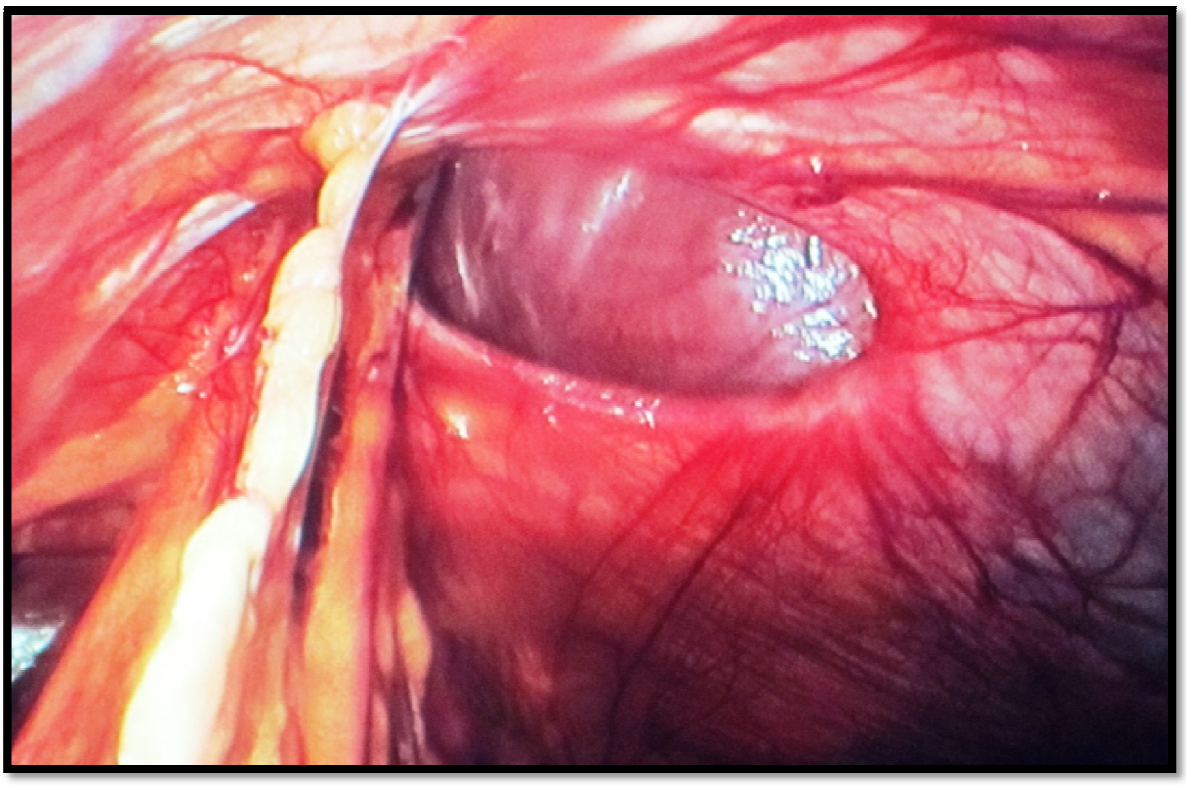
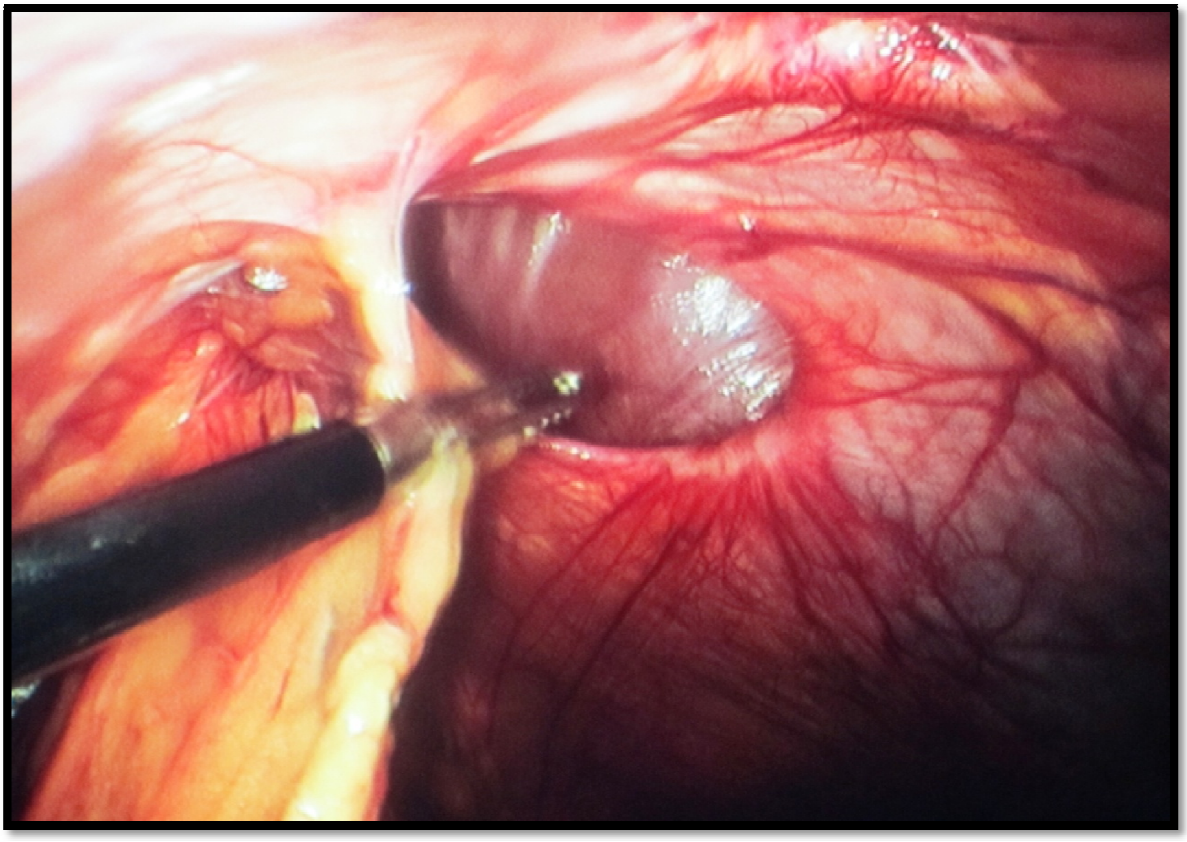


FIGURE 14 : ADHESION RELEASE



Access and port placement:

The first access port is usually a 10-mm trocar. As most of the patients have had previous abdominal surgery, accessing the abdomen away from previous incisions minimizes the risk of intra-abdominal injury. Two relatively safe areas for access include the subxiphoid midline, where the left lateral lobe of the liver protects the intra-abdominal organs, and subcostal, off the tip of the 11th rib at the anterior axillary line, where the preperitoneal fat or intra-abdominal adhesions are less. After safe access is achieved, the laparoscope is inserted and the abdominal cavity is explored. An angled scope is used to better view the anterior abdominal wall. Two to four 5-mm trocars are used as secondary ports. One or two are placed on the same side of the abdomen as the scope for initial adhesiolysis. Trocars are placed laterally as far from the hernia defect as possible to avoid covering them with mesh during the repair.

Lysis of adhesions:

The lysis of adhesions is often most difficult and dangerous part of this surgery. Bleeding and injury to bowel or other organs may occur, especially in patients with multiple previous surgeries or previously placed intraabdominal mesh. A plane is developed between the abdominal wall and the adherent abdominal contents to allow for safe, gentle, blunt, cold and sharp dissection. If no plane is cannot be clearly

dissected, abdominal wall is sacrificed to protect the bowel. Application of manual pressure over the hernia defect will help in reducing the incarcerated bowel and ease the lysis of adhesions of bowel to the abdominal wall in the hernia defect. Energy sources should be used only if bowel or other organs are clearly not adjacent or adherent to the abdominal wall. Delayed bowel injury can occur with the use of electrocautery or scissors or following ultrasonic dissectors, scissors, or grasper retraction. Thermal injury may occur and not be identified during initial dissection. Bleeding may be controlled with pressure, clips, or cautery after all nearby viscera has been cleared away. If bowel is eroded or ingrown into the previously placed mesh, the mesh and any attached abdominal wall is transected and left on the bowel. If there are however, any signs of bowel obstruction or if in the surgeon's judgment the mesh should not be left on the bowel, a bowel resection may be necessary. In this situation, a conversion to an open or laparoscopic assisted approach may be appropriate. It may be necessary to delay mesh placement, based on the surgeon's judgment.

Reduction of hernia contents:

In most of the cases, the contents can be reduced with safety by gentle traction using atraumatic laparoscopic graspers. External manual compression on the hernia as mentioned before will assist in safe reduction. If any bowel is incarcerated or is possibly included within the

mass of incarcerated contents, care should be taken to avoid excessive tension with graspers to minimize the risk of bowel injury. For incarcerated omentum, the main problem during reduction is bleeding. The use of energy sources, clips, sutures, or endoloops may be required if bleeding occurs. Rarely when the incarcerated contents are not reducible, sharp division of the fascial edges of the defect facilitate the reduction. The viability of reduced contents should be assessed after reduction. An open incision centered over the incarcerated hernia contents is an option if contents are not reducible. Laparoscopic repair can then be preceded after closure of the incision, or this may facilitate bowel resection if necessary.

Preparation of the anterior abdominal wall:

For hernias that are located centrally, there is no additional dissection necessary prior to placement of the mesh. However for hernias located above, or below or lateral to the mid-abdominal wall may require additional dissection to expose the posterior abdominal wall and prevent possible lead points for re-herniation. Division of the falciform or median umbilical ligament or the exposure of Cooper ligament may be necessary. This is typically performed with cautery or ultrasonic dissection due to vasculature running within these ligaments.

Hernia evaluation:

After the entire defect is exposed and dissection of the abdominal wall carried out for the placement of mesh, the defect is measured. It can be difficult to accurately measure the defect, especially in obese patients, due to the differential of the abdominal circumference at the skin and at the peritoneum. A piece of mesh measured and cut to size outside the abdomen would typically be larger than necessary when placed inside the abdomen and fixed to the peritoneum. Various tips are provided that may help to accurately measure the size of the defect at the peritoneal level. First, the abdomen can be deflated to minimize the difference in external and internal circumference of the abdominal wall. Spinal needles are also helpful when placed perpendicular to the abdominal wall at the edges of the defect. Measurement of the distance between the spinal needles during desufflation of the abdomen increases accuracy. The hernia defect be measured directly, using a suture or laparoscopic instrument or by cutting a plastic ruler lengthwise and placing it inside the abdominal cavity. In the presence of multiple defects, the maximum distance between all defects is typically measured, and one piece of mesh is used to cover all defects. When the defects are separated by long distances of healthy abdominal wall and use of two separate pieces of mesh may be more appropriate, based on the surgeon's judgment. For Incisional hernia repair, it is recommended that the entire previous incision be covered

FIGURE 15 : MESH FIXATION WITH TACKER

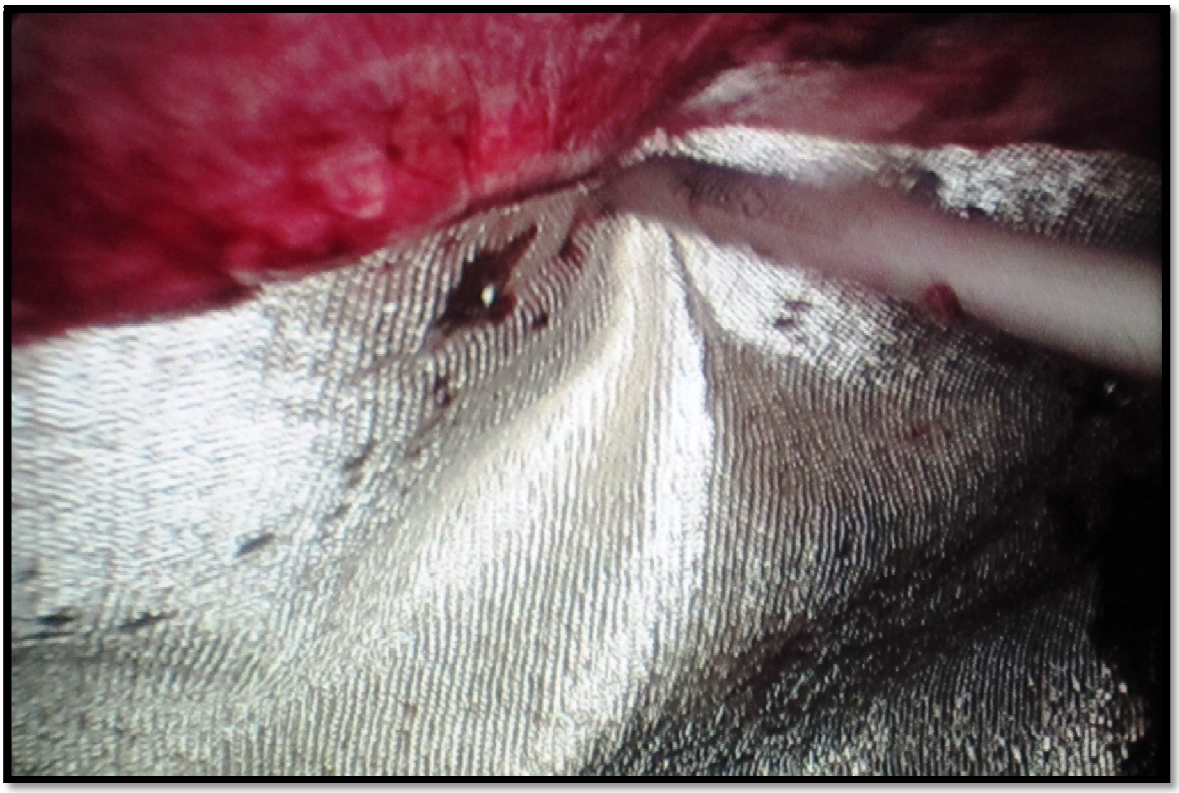
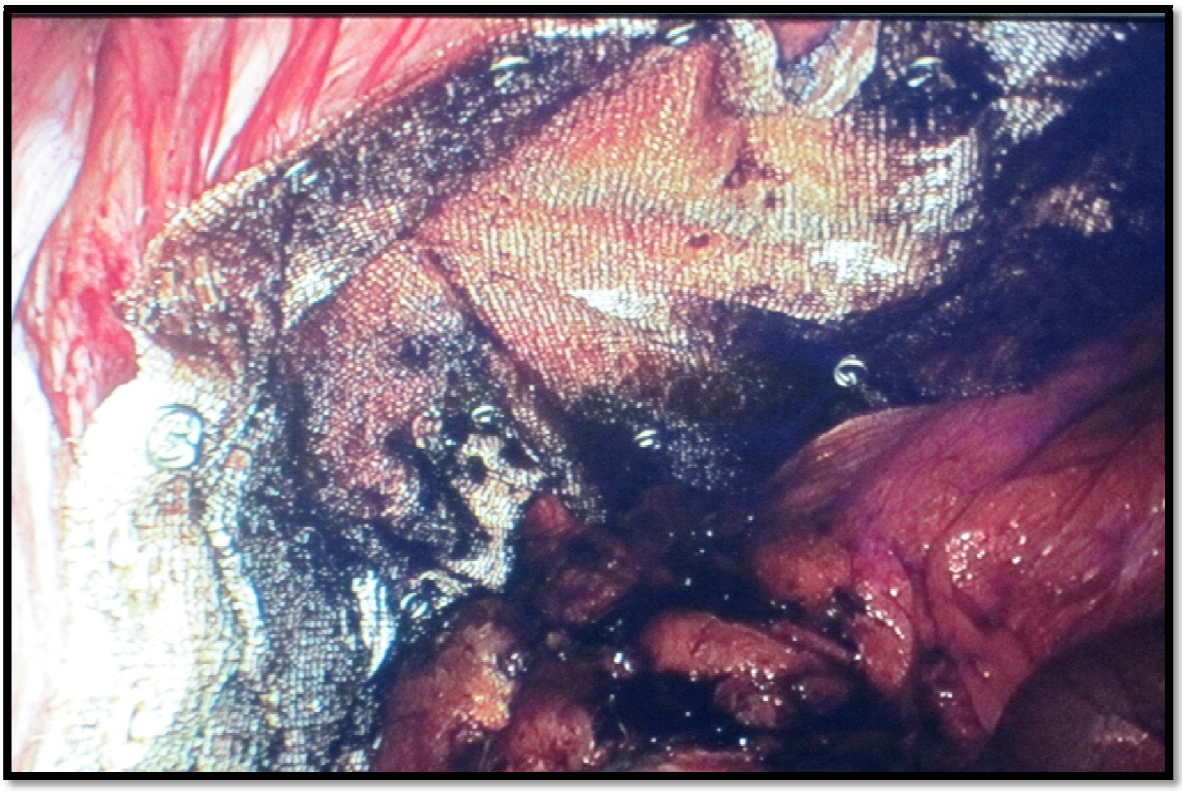


FIGURE 16 : MESH FIXED OVER THE DEFECT



with mesh unless adhesiolysis in this area would significantly increase the risks of the procedure.

Mesh preparation:

The mesh has to be placed on the desufflated abdomen, by using the marked outline of the hernia, in order to allow for coverage beyond the edges of the defect by at least 4 to 5 cm in all directions. Once the appropriate size of mesh is cut, it is marked for orientation and the planned location of the preplaced sutures. Markings on the skin help to plan the site of externalization of the cardinal stay sutures. Typically, four sutures are initially placed in the mesh. Too many sutures would make it difficult to find the appropriate suture inside the abdominal cavity, and too few sutures will not provide enough mesh fixation. Permanent sutures must be used.

Mesh placement:

After securing sutures at the cardinal points of the mesh and marking the mesh and abdomen, the mesh is rolled up, depending on its size, inserted through either the 10-mm trocar or the wound itself. A 5-mm grasper placed through a trocar on the opposite side of the patient can be used to grasp the mesh through the 10-mm wound and pull it into the abdomen. In order to visualize mesh placement, a 5-mm laparoscope in a third trocar may be utilized.

Mesh fixation:

The mesh is unrolled and the orientation is verified. The sutures are brought out through small incisions in the skin using a suture-passing instrument to grasp each arm of the suture in a separate pass. Local anesthesia is injected prior to inserting the suture passer. The angle of the suture passer is slightly different with each pass, allowing the needle to enter the abdominal wall through the same skin incision but exit the peritoneal surface of the abdominal wall approximately 1 cm away from the first suture arm. The sutures are not tied down until all four have been placed and lifted to demonstrate the appropriate tautness of the mesh. If a suture is in an unacceptable position, it is pulled back into the abdominal cavity and brought out through another more appropriate skin incision. After confirming that the mesh is in an appropriate position, the sutures are gently tied down, approximating the anterior fascia and up to 1 cm of full-thickness abdominal wall to the mesh. The edges of the mesh are then fixed to the abdominal wall with tacks or other point-fixation devices at approximately 1-cm intervals. Tacking one quadrant of the mesh at a time, and moving to the opposing quadrant rather than continuing down the length of the mesh, will help prevent migration of the mesh to one side of the abdomen. After the mesh is appropriately taut, additional full-thickness abdominal wall suture fixation may minimize the likelihood of recurrence. Most experts recommend that sutures be placed

at 3 to 5 cm intervals. Small defects or “Swiss cheese” types of hernia defects with most of the mesh approximating healthy abdominal wall might require less additional suturing, at intervals of 5 to 8 cm. Large defects with less mesh approximated to the abdominal wall relative to the defect will require more sutures at 3- to 5-cm intervals to minimize the risk of recurrence. The mesh should be kept tautly over the defect at the conclusion of the procedure. This ensures the mesh will follow the curve of the abdominal wall when the abdomen is desufflated, without wrinkling or enventrating out into the defect

Closure:

Exploration of the entire abdominal cavity must be carried out after the mesh fixation for active bleeding and other injuries. The CO_2 is pushed out of the abdominal cavity, and subcuticular sutures are used to close the skin of trocar wounds. Sutures or skin adhesives are used to close suture incision sites, and dry dressings are applied to all wounds. Prior to dressing the suture-site wounds, a hemostat or other thin instrument should be used to elevate the skin of these incisions in at least two directions. This will help to prevent the skin dimpling that can occur from the fixation sutures entrapping subcutaneous tissue.

Materials & Methodology

MATERIALS AND METHODOLOGY

Fifty cases of Incisional hernia admitted in the department of general surgery Coimbatore medical college and hospital during the period of August 2011 to August 2012 were studied.

Detailed history taking were followed in all cases admitted in ward. This include age, sex, weight of the patients and special mention was paid to

- Type of incision
- Post operative healing of wound
- Duration between surgery and development of hernia

Presence of pre disposing factors like obesity and particulars regarding diseases like hypertension, diabetes and other complications were made out.

Patients of Incisional hernia with fascial defect < 6cm were randomized into 2 groups (Group 1 & Group 2). Group 1 underwent laparoscopic mesh repair and group 2 underwent open mesh repair.

INCLUTION CRITERIA

- All patients with Incisional hernia with fascial defect < 6 cm in the age group of 20 to 60 years were included in the study.

EXCLUTION CRITERIA

- Recurrent Incisional hernias.
- Pediatric age group & patients below 20 years
- Patients with congenital abdominal wall weakness
- Incisional hernia patient with fascial defect > 6 cm

The data was collected in a prepared proforma. The diagnosis of Incisional hernia was made by clinical examination and by ultrasound.

The preoperative evaluation included history and clinical findings.

Routine laboratory investigations like hemoglobin, urine examination, random blood sugar, blood urea and serum creatinine, HIV, HBsAg were done. X-ray and ECG were done for patients above 40 years for anesthetic evaluation.

Preoperative treatment included:

• Correction of anemia

• Weight reduction if obese

• Improvement of nutritional status

• Treatment of respiratory infection if any

• Abstinence from smoking /alcohol if any

• Advice regarding breathing exercises

The type of anesthesia used was spinal anesthesia and general anesthesia in selected patients.

A single dose of preoperative broad spectrum antibiotic given followed by the same for 3 days postoperatively.

Analgesics - Injection Diclofenac sodium was given postoperatively for 2 days and later SOS.

Post operative care and complications

- After surgery all patients were monitored carefully for pain, bleeding, paralytic ileus, seroma, hematoma, wound infection and wound gaping.
- Pain was assessed using verbal graphic rating scale.
- A wound infection ranged from minimal discharge of pus from a single cutaneous suture to extensive and invasive process requiring lengthy hospitalization and intravenous antibiotics.
- Bleeding was defined as subcutaneous hematoma which can result from careless ties or cautery.

Discharge

The patients were discharged when fit and asked to come for regular follow up after 15 days, 1month, 3 months, 6 months, 1 year and 2 years. Different patients were followed up for different periods with many dropouts. The patients were advised to return to pre-hernia lifestyle except lifting heavy weights.

All were followed-up for post-operative pain, interference with activities of daily living, use of analgesics and recurrence.

Obervation and Results

OBSERVATION & RESULTS

During this study period the following observations were found.

Table 2: PATIENT CHARACTERISTICS

	LAPAROSCOPIC GROUP	OPEN GROUP
No. of patients	**25**	**25**
Mean Age	**43.3**	**43.8**
Sex (M:F)	**3:22**	**4:21**
Mean Weight (kg)	**54.0**	**56.9**

Age of the patient

Mean age was 43.3 years in laparoscopic group and 43.8 in open group. No statistical difference was noted between the 2 groups.

Sex ratio

Male: Female ratio in laparoscopic group was 3:22; in open group was 4: 21.

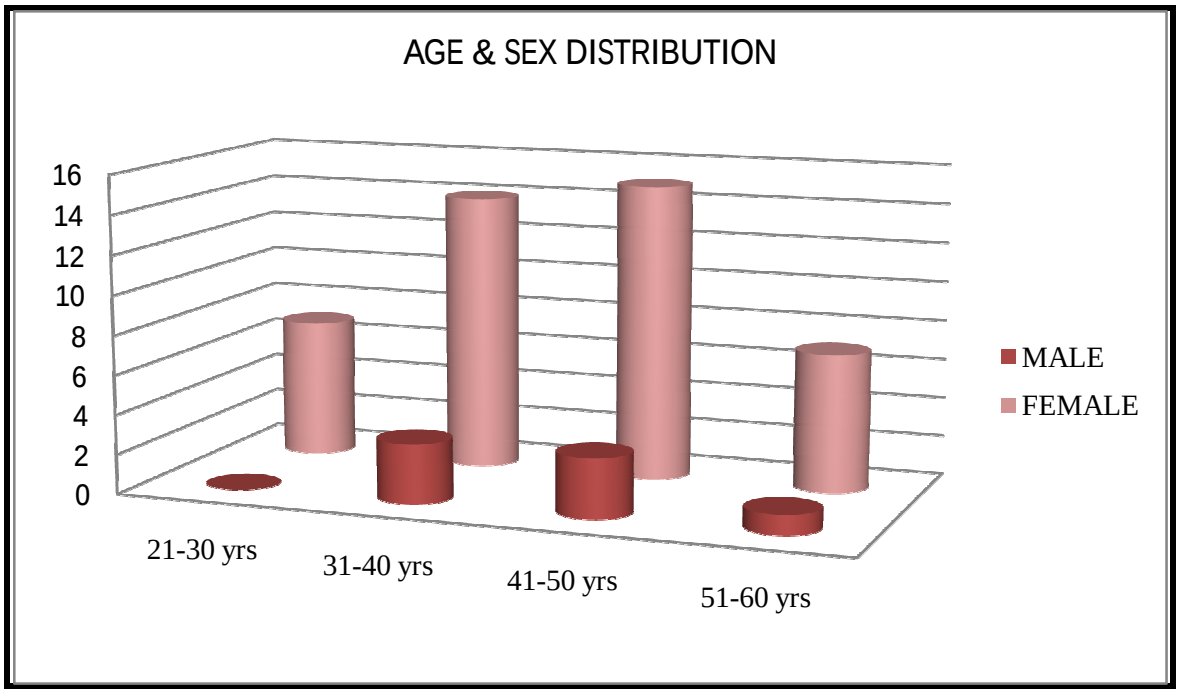
Weight of the patient

Mean weight of the patient in laparoscopic group was 54.0 kgs; while in open group was 56.9 kgs.

Table 3: AGE & SEX DISTRIBUTION

AGE GROUP		SEX		TOTAL
		MALE	FEMALE	
21 - 30	No. of patients	0	7	7
	%	0	14 %	14 %
31 - 40	No. of patients	3	14	17
	%	6 %	28 %	34 %
41 - 50	No. of patients	3	15	18
	%	6 %	30 %	36 %
51 - 60	No. of patients	1	7	8
	%	2%	14%	16 %
Total	No. of patients	7	43	50
	%	14 %	86 %	100 %

Chart 1 : AGE & SEX DISTRIBUTION IN BAR CHART



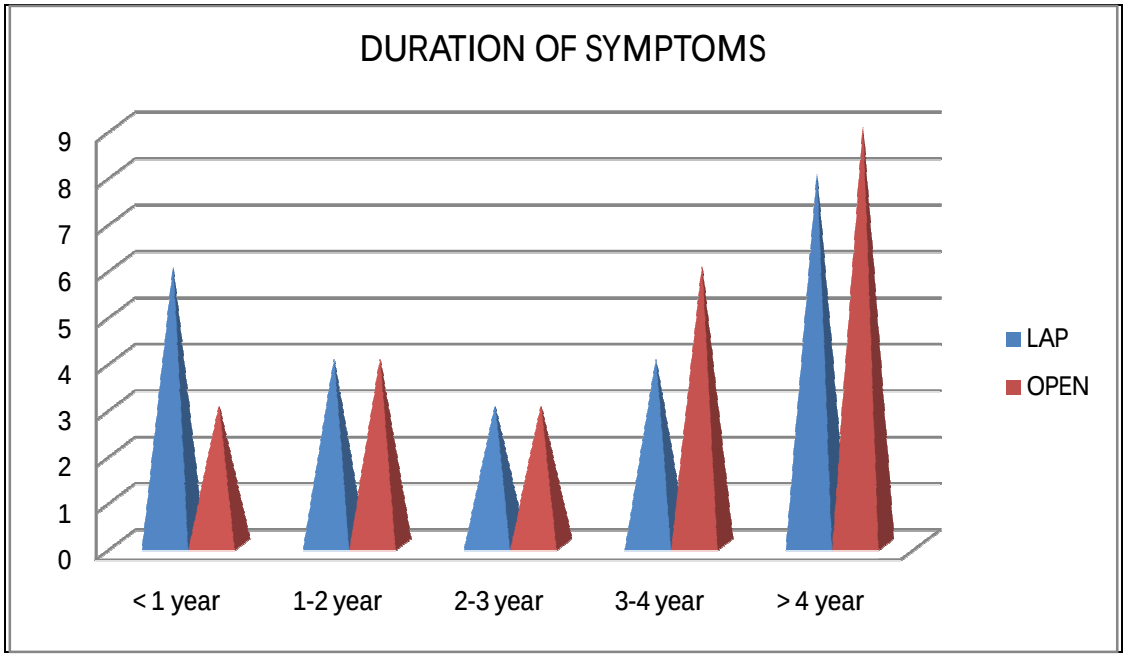
In our study incidence of Incisional hernia is more common in the age group between 41 – 50 years (18 out of 50 patients).

Women were most commonly affected then men because of increased frequency of surgeries (caesarean section & sterilization).

Table 4: DURATION OF SYMPTOMS

DURATION	LAPAROSCOPIC GROUP	OPEN GROUP	TOTAL NO. OF PATIENTS
< 1 year	6	3	9
1 – 2 year	4	4	8
2 – 3 year	3	3	6
3 - 4 year	4	6	10
> 4 year	8	9	17
Total	25	25	50

Chart 2 : DURATION OF SYMPTOMS IN PYRAMID.

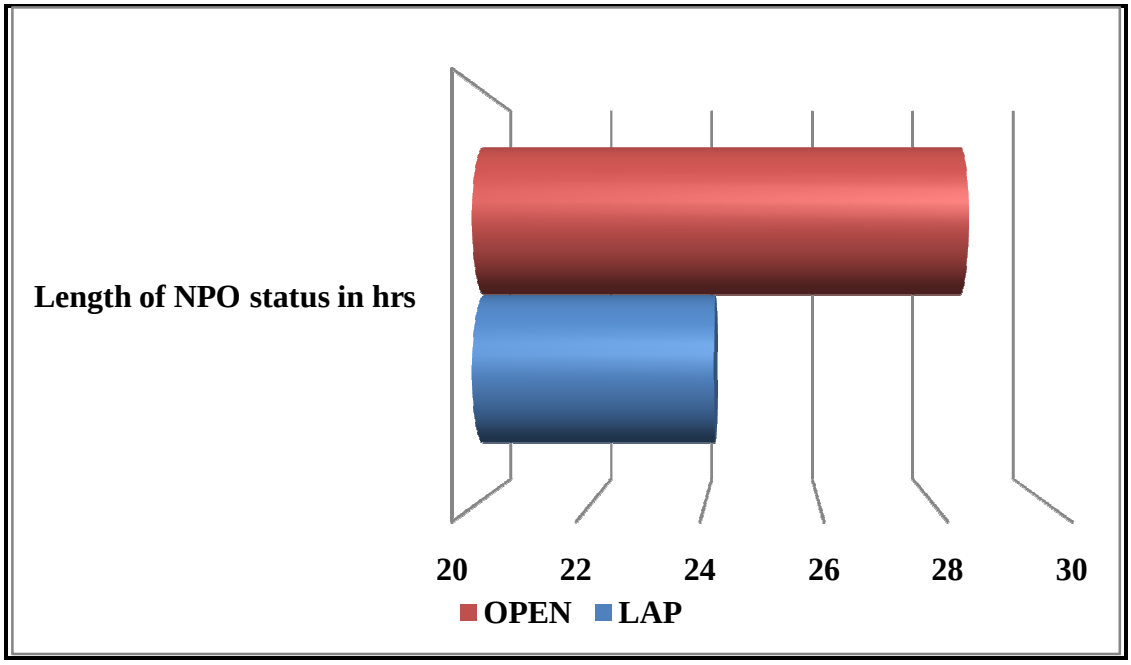


Only 18 % of the patients presented within first year of onset of symptoms. Most of the patients (3%) in our study presented after 4 years of onset of symptoms.

Table 5: LENGTH OF **NPO** STATUS (HRS)

	LAPAROSCOPIC GROUP	**OPEN GROUP**	**P - VALUE**
Length of NPO status (hrs)	24.16	28.56	P =0.0582

Chart 3: LENGTH OF **NPO** STATUS IN BAR DIAGRAM



Mean length of NPO status in hours in laparoscopic group was 24.16 hours and in open group was 28.56 hours. The p value is about

p = 0.0582 this shows there is no statistical difference between two groups.

Table 6: POST OPERATIVE MINOR COMPLICATIONS

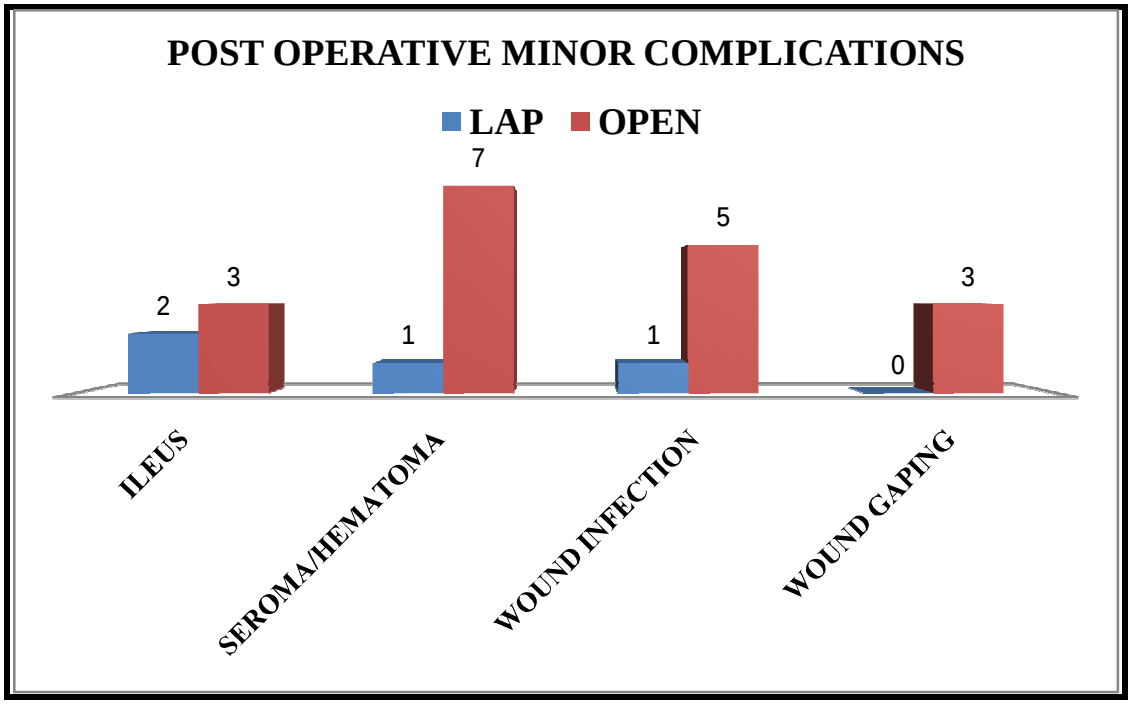
	LAPAROSCOPIC	**%**	**OPEN**	**%**
WOUND INFECTION	1	8	5	20
ILEUS	2	8	3	15
SEROMA / HEMATOMA	1	4	7	28
WOUND GAPING	0	0	3	12

In this study out of 25 patients in the laparoscopic group one patient developed serous collection in the umbilical port site which is treated with aspiration under aseptic condition and conservative management.

Out of 25 patients in the open group 7 patients had developed seroma in the surgical site. Out of these patients 2 were treated with conservative management and discharged with healthy wound, 5 patients were developed surgical site infection. These 5 patients were managed with pus culture directed i.v antibiotics and regular dressing, wound infection subsided in 2 patients and 3 patients developed wound gapping which is treated with secondary suturing under local anesthesia. In this study 2 patients in the laparoscopic group and 3 patients in the open

group developed post operative ileus, all the patients were treated with conservative line of management.

Chart4:POST OPERATIVE MINOR COMPLICATIONS IN BAR DIAGRAM.



In the laparoscopic group one patient developed port site infection in the umbilical port and was treated with sterile dressing , pus culture & sensitivity based antibiotics. As already mentioned 5 patients in the open group developed wound infection and 2 patients were managed with daily dressing and i.v antibiotics, 3 patients developed wound gapping and treated with secondary suturing.

None of the patients in the laparoscopic group developed wound gapping when compared to 3 patients in the open group.

TABLE 7: RETURN TO REGULAR ACTIVITIES IN MEAN DAYS

	LAPAROSCOPIC GROUP	**OPEN GROUP**	**P** value
Return to regular activities (days) in mean	22.4	30.2	P < 0.0001

In our study most of the patients in the laparoscopic group returned to their regular activities in the 3 rd post operative week, in the open group most of the patients taken 1 month to return to their regular activities.

Mean days taken by laparoscopic group for return to regular activities is about 22.4 days and 30.2 days in open group.

Chart 5: RETURN TO REGULAR ACTIVITIES IN PIE CHART

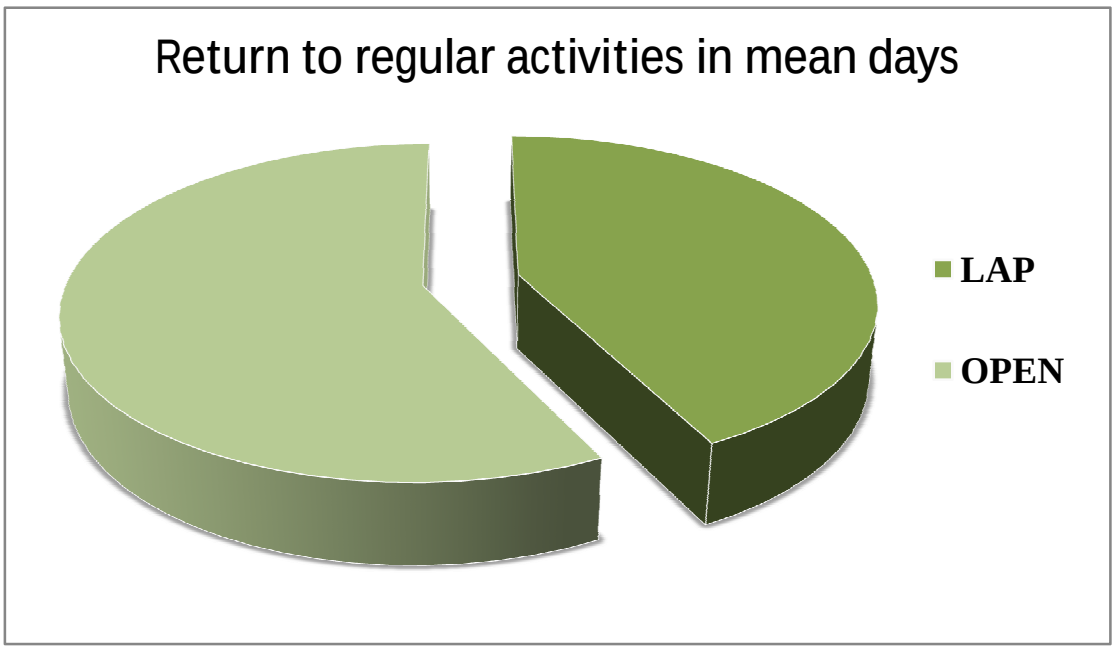


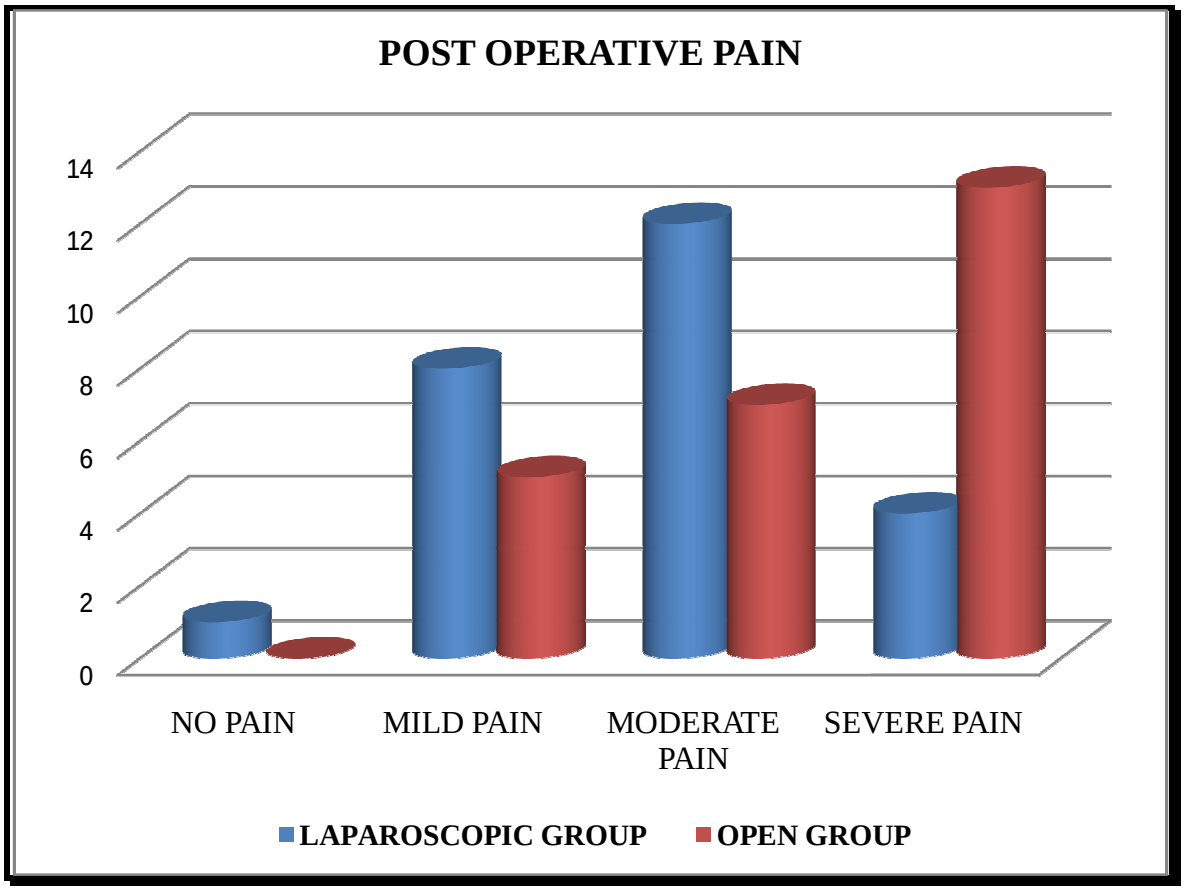
TABLE 8: POST OPERATIVE PAIN

SURGERY		PAIN SCALE				TOTAL
		No pain	**Mild**	**Moderate**	**Severe**	
Laparoscopic group	No .of patients	1	8	12	4	25
	%	4	32	48	16	100
Open group	No. of patients	0	5	7	13	25
	%	0	20	28	52	100

In our study 4 patients in the laparoscopic group complained severe pain in the immediate post operative period. In open group 13 patients complained severe pain.

Pain was more severe when the endo tachors were used to fix the mesh around the fascial defect than the suture fixation.

Chart 6: POST OPERATIVE PAIN IN BAR CHART



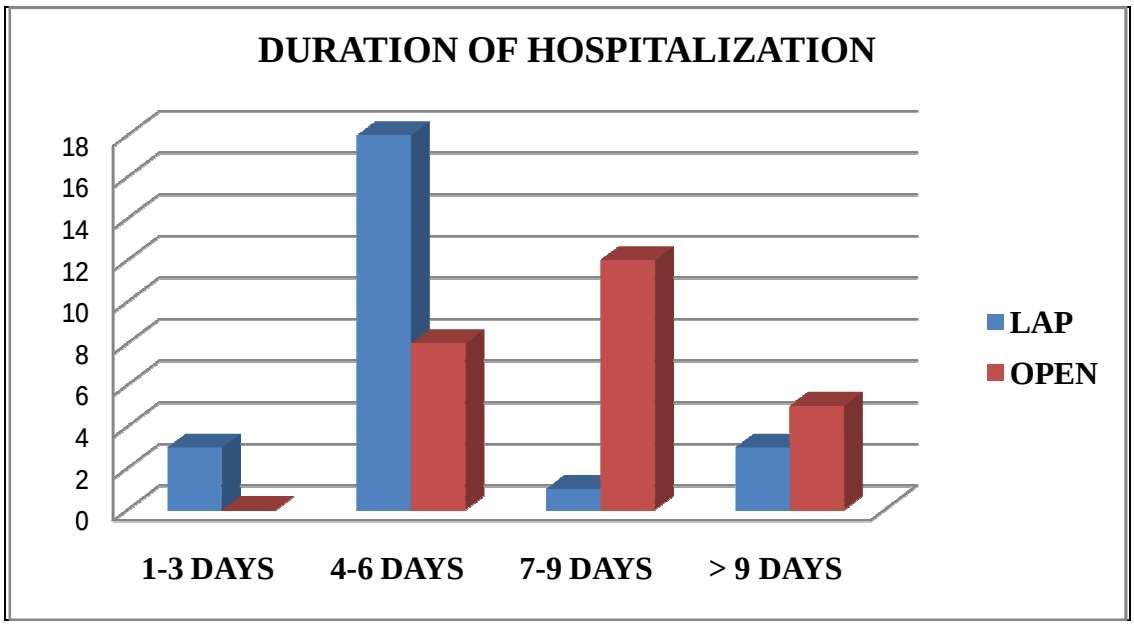
One patient in the laparoscopic group is pain free in the immediate post operative period.

Most of the patients in the laparoscopic group (48 %) were complained moderate pain which requires parentral analgesics. But most of the patients in the open group (52 %) were complained severe pain, which also subsided with parentral analgesics.

TABLE 9: DURATION OF HOSPITAL STAY

SURGERY		HOSPITALIZATION				MEAN
		1-3 days	4-6 days	7-9 days	>9 days	
Laparoscopic group	No. of patients	3	18	1	3	5.6
Open group	No. of patients	0	8	12	5	8.4
Total	No. of patients	3	26	13	8	P < 0.0001

Chart 7: DURATION OF HOSPITAL STAY IN BAR DIAGRAM



Most of the patients in the laparoscopic group (72 %) were discharged between 4-6 days, while most of the patients in the open group (48 %) were discharged between 7-9 days.

Mean days of hospitalization in laparoscopic group were 5.6 days, while in laparoscopic group were 8.4 days.

COST ANALYSIS IN OUR HOSPITAL SETUP

1. LAPAROSCOPIC GROUP:

1. Cost of synthetic Mesh (PROCEED 15 x15) = Rs.19, 000

2.Mesh fixation Tacker = Rs.8,000

3.Wound closure (1-0 vicryl) =Rs. 360

4. Cost of antibiotics & analgesics per day = Rs.100

Mean days of hospital stay = 5.6 days

Mean cost of antibiotics & analgesics = 5.6 x 100 = Rs.560 /-

5. Cost of Hospital stay per day = Rs.300

= 5.6 x 300= Rs.1680/

2. OPEN GROUP

1. Cost of synthetic Mesh (PROLENE 15 x15) = Rs. 600

2. Mesh fixation (1-0 Prolene) = Rs.240

3. Wound closure (1-0 catgut & skin stapler) 100+300 = Rs.400

4. Cost of antibiotics & analgesics per day = Rs.100

Mean days of hospital stay = 8.4 days

Mean cost of antibiotics & analgesics = 8.4 x 100

= Rs.840 /-

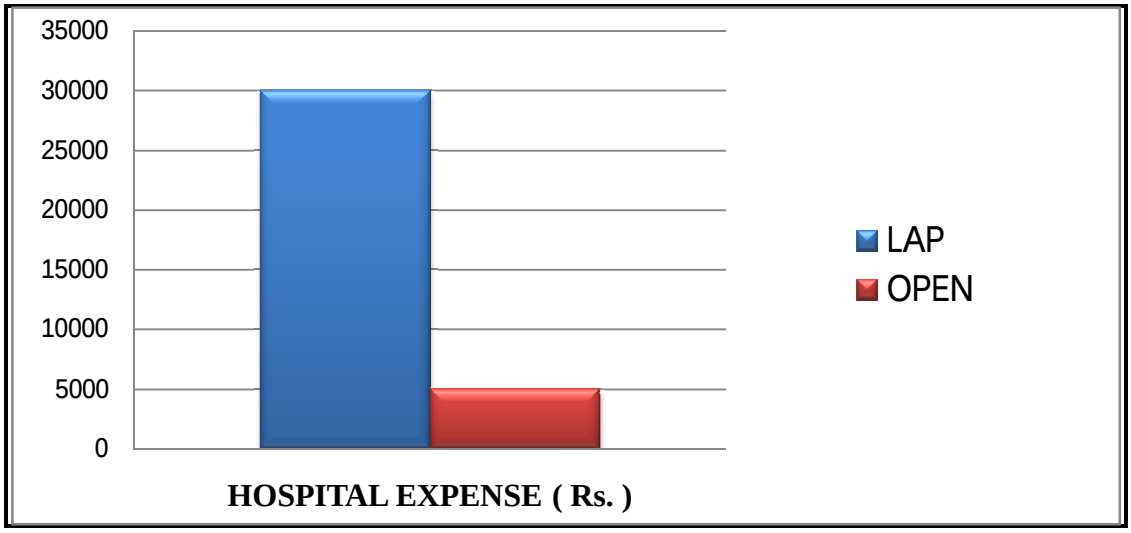
5. Hospital stay per day = Rs.300

= 8.4 x 300 = Rs.2520/-

Table 10: COST ANALYSIS OF LAPAROSCOPIC Vs OPEN MESH REPAIR

COST COMPONENT	MEAN COST PER PATIENT	
	LAP	OPEN
Investigation cost	Rs.400	Rs.400
Surgery		
Synthetic Mesh	Rs.19,000	Rs.600
Mesh fixation	Rs.8000	Rs.240
Wound closure	Rs.360	Rs.400
Antibiotics & analgesics	Rs.560	Rs.840
Hospital stay / day	Rs.1680	Rs.2520
Total Expense (approx.)	Rs.30,000/-	Rs.5000/-

Chart 8 : **COMPARISION HOSPITAL EXPENSE IN BAR CHART**



This showed cost of laparoscopic surgery was 6 times higher than open surgery. This is mainly due to the high cost of synthetic mesh and mesh fixation device used in laparoscopic surgery.

Discussion

DISCUSSION[11,12,13,14,15,16,17,18,19,21]

1. AGE &SEX INCIDENCE[11,12]:

In the study conducted by Harikrishnan et al in 1991 maximum cases of Incisional hernia were between the age group of 30-50years. In my study out of 50 cases, 17 cases were between 31-40years and 18 cases were between 41-50 years. So the maximum percentage (70%) was constituted by cases of age group between 31and 50years. This matches with the results of the study conducted by Harikrishnan et al.

According to the study conducted by de Silva (1991)there was increased incidence of Incisional hernia in females(81%) . in this study out of 50 cases 43were females accounting for 96%.hence it can be considered that there is increased incidence in females , which is comparable to above study.

The higher incidence in females is probably due to the greater number of caesarean section, sterilization and hysterectomies being performed on them.

2. POST OPERATIVE PAIN

Immediate post operative pain was assessed using verbal graphic rating scale. A verbal rating scale (VRS) consists of a list of adjectives describing different levels of pain intensity or pain effect, ordered from least to most intense. The patient reads the list and chooses the one word that best describes the intensity of their pain experience at that moment. Many different VRS lists with variation in pain intensity levels have been created.

In a 4 paints VRS for example, no pain would be given a score of 0, mild pain a score of 1,moderate pain a score of 2, and severe pain a score of 3. The strengths of VRSs include the ease with which they can administered and scored. Because, they are generally easy to understand compliance rates for VRSs are as good as or better than those for other measures of pain intensity under most conditions

In this study 16 % (4 out of 25) of patients in the laparoscopic group and 52 % (13 out of 25) of patients in the open group complained severe pain in the immediate post operative period. One patient in the laparoscopic group was pain free in the immediate post operative period.

This shows laparoscopic Incisional hernioplasty is associated with lesser degree of post operative pain compared to open hernioplasty.

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3. DURATION OF NPO STATUS[21]

Table 11: Raftopoulos l et(2003) Vs This study

STUDY	YEAR	NO.OF PATIENTS		LENGTH OF NPO STATUS	
		lap	open	lap	Open
Raftopoulos l et al	2003	50	22	10	55.38
This study	2012	25	25	24.16	28.56

P value = 0.0582

In the present study mean duration of NPO status is about 24.16 hrs in laparoscopic group and 28.56 hrs in open group the P value was 0.0582. This shows there is no significant difference in duration of NPO status. This may be due to less number cases studied in our study compared to the above study.

4. POST OPERATIVE WOUND INFECTION[13,15,16,17,18,19]

In the various studies by Park , Zanghi, Van 'T Reit, Bencini, Olmi S et al, post operative infection as follows, it is compared with present study

TABLE 12 : Comparison of post operative wound infection with Standard literature

STUDY	YEAR	NO.OF CASES		WOUND INFECTION			
		LAP	OPEN	LAP	%	OPEN	%
Park	1998	56	49	0	0	1	2.04
Zanghi	2000	11	15	0	0	1	6.66
Van 'T Reit	2002	25	76	1	4	11	14.47
Bencini	2003	42	49	0	0	6	12.24
Olmi S et al	2005	50	50	1	2	7	14.00
This study	2012	25	25	1	4	5	32.00

In the present study one patient in the laparoscopic group and 5 patients in the open group developed wound infection , it shows wound infection rate were 5 times more in the open group, all the above mentioned standard studies also showed that wound infection rate was higher in open repair of Incisional hernia.

5. **DURATION OF HOSPITAL STAY**[13,,15,16,17,18,19]

In the various studies by Park , Zanghi , Van ‘T Reit, Bencini, Olmi S et al, length of hospital stay as follows, it is compared with present study

Table 13 : Comparison of Duration of hospital stay with standard studies

STUDY	YEAR	NO.OF CASES		DURATION OF HOSPITAL STAY	
		LAP	OPEN	LAP	OPEN
Park	1998	56	49	3.4	6.5
Zanghi	2000	11	15	3.5	11
Van ‘T Reit	2002	25	76	4	5
Bencini	2003	42	49	5	8
Olmi S et al	2005	50	50	2.1	8.1
This study	2012	25	25	5.6	8.6

P value < 0.0001.

Mean length of hospital stay in the present study in laparoscopic group was 5.6 days and open group was 8.6 days it is comparable with study conducted by Bencini in 2003.

In the present study mean length of hospital stay was less (5.6 days) in laparoscopic group compared to open group (8.6 days) and the p value was < 0.0001,it is a statically significant value. All the above mentioned standard studies also showed similar results.

5. RETURN TO REGULAR ACTIVITIES[21] (DAYS)

In the study conducted by Raftopoulos l et al in 2003 the results of return to regular activities in days is as follows it is compared with present study

Table 14 : Comparison with standard study

Study	Year	NO.OF PATIENTS		Return to regular activities (days)	
		lap	open	lap	Open
Raftopoulos l et al	2003	50	22	21.1	33.75
This study	2012	25	25	22.4	30.2

P value < 0.001

The present study patients in the laparoscopic group takes 22.4 days and patients in the open group takes 30.2 days for return to their regular activities it shows patients treated with laparoscopic Incisional repair return to their regular activities earlier than the patients treated with open mesh repair and the p value was < 0.0001. It is comparable with standard study by Raftopoulos et al, where the laparoscopic patients take 21.1 days and open group patients 33.75 days.

6. COST EFFECTIVENESS

In this study the expenditure incurred by the government for laparoscopic surgery was approximately about Rs.30,000 and open surgery was about Rs.5000 . It showed that expense of laparoscopic surgery was 6 times more than the open surgery in our hospital setup. This is mainly because of high cost of synthetic mesh and fixation tacker used in laparoscopic surgery.

These cost differences were partly offset by higher cost of post operative complications in open group.

Even though stay in surgical ward and sick leave was shorter for patients underwent laparoscopic repair than those with open repair laparoscopic surgery is associated with more surgical expense in our hospital setup. Only some of the patients in open surgery whom developed complications had to spend more health expense than laparoscopic surgery .

Conclusion

CONCLUSION

- This randomized control study included total of 50 cases.
- 25 cases underwent laparoscopic repair and same number underwent open repair.
- There was increased incidence of Incisional hernia among females
- There was lesser incidence of post operative wound complications among the patients underwent laparoscopic repair.
- Laparoscopic repair favors less post operative pain, early post operative enteral feed and lesser duration of hospital stay.
- Faster recovery in laparoscopic repair allows early return to regular activities.
- Laparoscopic Incisional hernioplasty offers better visualization of the defect and hence better repair.

Because of the above mentioned factors Laparoscopic repair will probably have a positive effect on financial and human resources.

Hence, apart from cost effectiveness Laparoscopic Incisional hernioplasty seems to be superior, more advantageous and a better alternative for open hernioplasty.

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Proforma

PROFORMA

Name : Age / Sex: IP.No:

DOA : DOS : DOD:

Occupation : Weight :

Address :

Chief complaints

1. Duration of swelling
2. Onset of swelling
3. Site of onset of swelling.
4. Size and extent when appeared
5. Pain or discomfort
6. Does it disappear automatically on lying down
7. History suggestive of complication.

Past history

1.Nature of previous surgery - Emergency/Elective

-Type of incision

-Post operative period

-Time interval between previous surgery and presentation

2. H/O DM / HTN / TB / ASTHMA / EPILEPSY.

Personal history

1. Diet
2. Sleep
3. Bowel / Bladder habits
4. Smoker / Alcoholic

General examination

1. Obese / Not Obese

2. Nutritional status : Poor / Avg / Good
3. Pallor
4. Icterus
5. Cyanosis / Clubbing
6. General – Lymphadenopathy
7. PR
8. BP

Systemic exam

Per Abdomen

Inspection

1. Abd obesity,
2. Swelling – site & size
3. Shape
4. Position & Extent
5. Skin over the swelling
6. Impulse on coughing
7. VIP

Palpation

1. Tenderness
2. Local rise in temperature
3. Size & shape
4. Position and Extent
5. Shape and size of defect
6. Consistency
7. Contents
8. Reducibility

Percussion

Dull / Resonant

Auscultation

Bowel Sounds

PR

Chronic constipation

In male patients -Enlarged prostate

RS

Inspection

Percussion

Auscultation

CVS

Inspection

Percussion

Auscultation

CNS

Higher Mental functions

Diagnosis

Investigations

Hb, TC , DC

Grouping & Typing

Urea

Creatinine

RBS

Urine – R

ECG

Chest X-ray

Management

Preoperative treatment

1. Correction of anaemia
2. Weight reduction if obese
3. Improvement of nutritional status
4. Treatment of respiratory infection if any
5. Abstinence from smoking / alcohol if any
6. Advice regarding breathing exercises

Operative procedure

Type of surgery (Laparoscopic or Open hernioplasty)

Anaesthesia GA / SA
Prophylactic antibiotic
Drains

Post operative period
Pain,
Seroma / Hematoma, Wound infection, wound gapping
Paralytic ileus
Drain removal
Suture removal

Follow up
Recurrence within 1 year
After 1 year.

Consent Form

CONSENT FORM

It has been explained to me in my mother tongue and I completely understand my condition, its related complications and the treatment options available. I have been explained in detail regarding this study - "*A COMPARATIVE STUDY OF LAPAROSCOPIC MESH REPAIR VERSUS OPEN MESH REPAIR FOR INCISIONAL HERNIA*". I hereby give my consent to participate in the above mentioned study.

DATE:

PLACE:

SIGNATURE OF THE PATIENT & NAME :

SIGNATURE OF THE RELATIVE & NAME :

SIGNATURE OF THE WITNESS & NAME :

Master chart

MASTER CHART – LAPAROSCOPIC HERNIOPLASTY

S.. NO	NAME	AGE	SEX	IP.NO	WEIGHT(Kgs)	DATE OF SURGERY	DATE OF DISCHARGE	NO. OF STAY	DURATION OF SYMPTOMS (months & years)	COMORBID CONDITIIN	NPO (hrs)	SEROMA / HEMATMA -	WOUND INFECTION	WOUND GAP	ILEUS	RETURN TO REGULAR ACTIVITIES (DAYS)
1	shanthi	26	F	37722	45	10.8.11	13.8.11	3	8 months	-	18	-	-	-	-	18
2	Shanthamani	40	F	47331	65	24.8.11	29.8.11	5	2.5years	-	18	-	-	-	-	21
3	Parimala	40	F	48853	54	7.9.11	10.9.11	3	6 years	-	20	-	-	-	-	21
4	Anjali	35	F	42259	48	30.7.11	3.8.11	4	18 months	-	18	-	-	-	-	18
5	Suseela	35	F	5414	68	17.2.12	21.2.12	4	9 months	-	22	-	-	-	-	20
6	Sumathi	36	F	5431	61	15.2.12	21.2.12	6	2.5years	-	16	-	-	-	-	18
7	vasantha	43	F	33605	48	14.6.12	17.6.12	3	8years	-	24	-	-	-	-	16
8	Saraswathi	55	F	35827	52	2.7.12	13.7.12	11	10years	DM	36	YES	YES	-	-	28
9	Papathi	47	F	51128	54	29.8.12	2.9.12	4	3.5years	-	22	-	-	-	-	24
10	Chinnaiyan	40	M	17448	44	5.4.12	11.4.12	6	10 months	-	20	-	-	-	-	28
11	Haneefa	43	M	31858	57	9.8.11	13.8.11	4	4 years	-	36	-	-	-	-	21
12	Saraswathi	28	F	26852	66	16.6.12	22.6.12	6	6 years	-	32	-	-	-	-	18
13	Sivaghami	55	F	24078	47	18.5.12	23.5.12	5	4years	HTN	32	-	-	-	-	25

14	Shakira	40	F	63015	52	19.10.12	23.10.12	4	5years	-	28	--	-	-	-	21
15	amutha	51	F	51809	54	11.9.12	15.9.12	4	6 years	DM	28	-	-	-	-	22
16	Murugan	48	M	40983	62	25.7.12	1.8.12	7	20 months	-	40	-	-	-	-	24
17	Kamala	42	F	13127	58	6.3.12	11.3.12	5	40 months	-	28	-	-	-	-	28
18	Sathya	25	F	48650	61	25.8.12	31.8.12	6	10 months	-	32	-	-	-	-	21
19	vijayalakshmi	47	F	10453	64	29.2.12	5.3.12	5	1.5years	-	28	-	-	-	-	24
20	Vijaya	49	F	58745	43	18.10.11	28.10.11	10	10 years	DM, HTN	40	-	-	-	YES	30
21	Kurshith begam	29	F	63280	50	21.10.12	27.10.12	6	6 months	-	36	-	-	-	-	24
22	Sivagami	43	F	41208	44	22.7.12	27.7.12	5	7years	-	32	-	-	-	-	24
23	Indirani	30	F	17911	57	5.4.12	11.4.12	6	15months	-	36	-	-	-	-	22
24	Sathyarani	26	F	10455	52	27.2.12	3.3.12	5	8month	-	24	-	-	-	-	16
25	Suseela	46	F	72750	44	26.12.11	8.1.12	13	30 months	-	48	YES	-	-	YES	28

MASTER CHART – OPEN HERNIOPLASTY

S.NO	NAME	AGE	SEX	IP.NO	WEIGHT (Kgs0	DATE OF SURGERY	DATE OF DISCHARGE	NO.OF STAY	DURATION OF SYMPTOMS(months&years)	CO MORBID CONDITIIN	NPO (hrs)	SEROMA / HEMATOMA	WOUND INFECTION	WOUND GAP	ILEUS	Return to regular activities (days)
1	Clara	37	F	37684	54	06.8.11	12.8.11	6	3 years	-	20	-	-	-	-	28
2	Lakshmi	59	F	52942	63	08.3.12	16.3.12	8	4years	DM	22	YES	-	-		30
3	Rakiyappan	60	M	38505	68	27.7.12	02.8.12	7	10years	-	36	-	-	-	YES	28
4	padhma	40	F	50393	46	23.12.11	29.12.11	7	2.5years	-	10	-	-	-	-	21
5	Vadivu	46	F	10906	45	29.2.12	6.3.12	6	3 year	HTN	19	-	-	-	-	28
6	Thilagavathi	29	F	13846	56	22.3.12	28.3.12	6	9month	-	18	-	-	-	-	28
7	Parameshwari	42	F	25604	43	24.5.12	1.6.12	8	2.5years	-	20	-	-	-	-	36
8	Shanthi	45	F	42644	45	18.8.12	24.8.12	6	4.5years	-	22	-	-	-	-	32
9	Govinthammal	59	F	50695	58	20.9.11	26.9.11	6	12 years	HTN	30	-	-	-	YES	30
10	Rasiyabegam	38	F	39731	47	8.10.11	15.10.11	7	8month	-	28	-	-	-	-	28
11	Parvathi	46	F	48911	56	29.8.12	14.9.12	16	4.5years	DM	36	YES	YES	YES	-	45
12	Sivakumar	31	M	13222	61	12.3.12	20.3.12	8	2years	-	24	-	-	-	-	21
13	Kalamani	40	F	38778	67	9.7.12	14.7.12	5	1.5years	-	18	-	-	-	-	28
14	Meena	35	F	36082	69	4.7.12	10.7.12	6	1.5years	-	18	-	-	-	-	25
15	Muthulakhmi	42	F	38216	47	30.5.12	7.6.12	8	8years	-	18	-	-	-	-	28
16	Noornisha	58	F	17763	53	2.4.12	11.4.12	9	5years	-	34	YES	-	-	-	36
17	Jothimuthu	43	M	17661	65	4.4. 11	19.4.11	15	12 years	DM,HTN	30	YES	YES	YES	-	45
18	Shankar	38	M	31582	66	7.8.11	16.8.11	9	6years	-	28	-	-	-	-	28
19	Fathimabanu	57	F	52162	43	2.5.12	8.5.12	6	7years	-	32	-	-	-	-	30
20	Krishnaveni	35	F	65541	59	23.11.11	3.12.11	10	3.5years	-	36	YES	YES	-	YES	30
21	Myillathal	45	F	27076	70	16.5.12	31.5.12	15	2 years	DM,HTN	18	YES	YES	YES	-	42
22	Reginabeegam	50	F	32851	56	25.7.11	2.8.11	8	4 years	DM	22	-	-	-	-	30
23	Papathi	40	F	49207	64	3.8.11	11.9.11	8	3.5years	-	23	-	-	-	-	22
24	Jayalakshmi	39	F	38554	55	13.7.12	24.7.12	11	6month	-	20	YES	YES	-	-	28
25	Vasanthi	41	F	46430	67	19.8.12	28.8.12	9	5 years	-	22	-	-	-	-	28